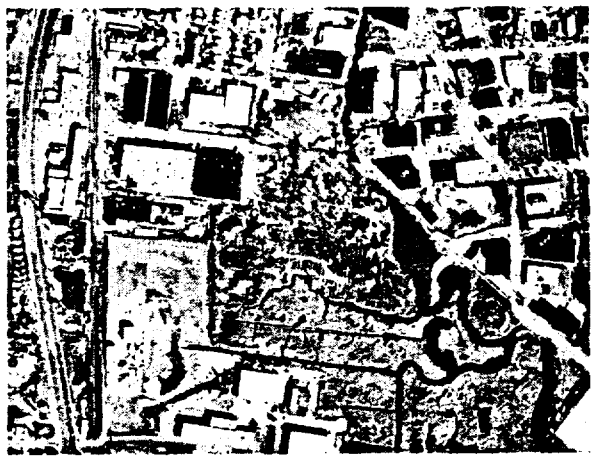
Environmental Group

Exponent

Phase I Remedial Investigation Report: Ventron/Velsicol Site, Wood-Ridge/Carlstadt, New Jersey

Volume 3 of 3:
Background Investigation
Technical Memorandum



Prepared for

Velsicol Chemical Corporation
c/o Memphis Environmental Center
Memphis, Tennessee

Morton International, Inc.
Chicago, Illinois

Exponent

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
Berk	F.W. Berk and Company of England
BITM	background investigation technical memorandum
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
ECRA	Environmental Cleanup Responsibility Act
EPA	U.S. Environmental Protection Agency
HMDC	Hackensack Meadowlands Development Commission
Morton	Morton International, Inc.
NJDEP	New Jersey Department of Environmental Protection
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
POTW	publicly owned treatment works
RI/FS	remedial investigation and feasibility study
Site	Ventron/Velsicol NPL site
SoPC	substance of potential concern
TBC	to be considered
Velsicol	Velsicol Chemical Corporation
Ventron	Ventron Corporation
Wolf	Robert and Rita Wolf
WRCC	Wood Ridge Chemical Corporation

1. INTRODUCTION

Exponent, formerly PTI Environmental Services, prepared this background investigation technical memorandum (BITM) on behalf of the Ventron/Velsicol Site Action Committee as a deliverable under the remedial investigation/feasibility study (RI/FS) work plan (CRA 1996). The BITM summarizes currently available information about the Ventron/Velsicol National Priorities List (NPL) site (Site) and describes the background for work conducted in the RI/FS. The Site and its surrounding area have a long history of investigations performed by many different parties, beginning in the 1950s and intensifying through the 1970s and 1980s. Consequently, a substantial volume of information exists of varying, and in many cases unknown, quality. This BITM does not directly include all prior data, but rather summarizes available pertinent information and provides references to data reports and other sources of further information. Exponent has not attempted to validate or assess the quality of existing data, some of which may not be of suitable quality to combine directly with new data to be collected in the RI/FS. The existing data are, however, useful for developing an overall understanding of the Site and its characteristics. Any historical data used in the RI/FS will have to be reviewed further to determine whether the quality is adequate for the intended purpose. Exponent has not independently verified information on the Site history provided in other reports, but has relied on the information in the cited references.

Following this introduction, the BITM is organized into the following sections:

- Section 2 — Site Description
- Section 3 — Nature of the Problem
- Section 4 — Preliminary Identification of ARARs and TBCs
- Section 5 — References.

Section 2 describes the Site history, including a review of aerial photography, property parcels that make up the Site, physical Site characteristics, and ecological Site characteristics. Section 3 focuses on issues related to the Site contamination, including a preliminary conceptual model for contaminant sources and exposure pathways of concern. The focus of the remedial investigation will be to expand upon and further define the nature of the problem and the conceptual model. Section 4 lists potentially applicable or relevant and appropriate requirements (ARARs) and to-be-considered (TBC) guidances. ARARs and TBCs will be further refined during the feasibility study.

2. SITE DESCRIPTION

Section 2 provides a summary description of the Site, including a review of historical Site activity. Section 2.1 describes the Site location and general layout; Section 2.2 describes the Site history; Section 2.3 provides a legal Site description; Section 2.4 reviews historical aerial photographs; Section 2.5 provides a physical description of the Site, focusing on soils, groundwater, and surface water; and Section 2.6 summarizes the Site ecology.

2.1 SITE LOCATION

The Site is located in Bergen County, New Jersey, within the boroughs of Wood-Ridge and Carlstadt. It is an irregularly shaped 38-acre area with three current owners, described further in Section 2.3. Approximately 15.7 of the 38 acres are within the Borough of Wood-Ridge, and the remaining 22.6 acres are within the Borough of Carlstadt. The entire Site is generally within the Hackensack Meadowlands area, and the portion in Carlstadt is also within the Hackensack Meadowlands Development Commission (HMDC) jurisdiction.

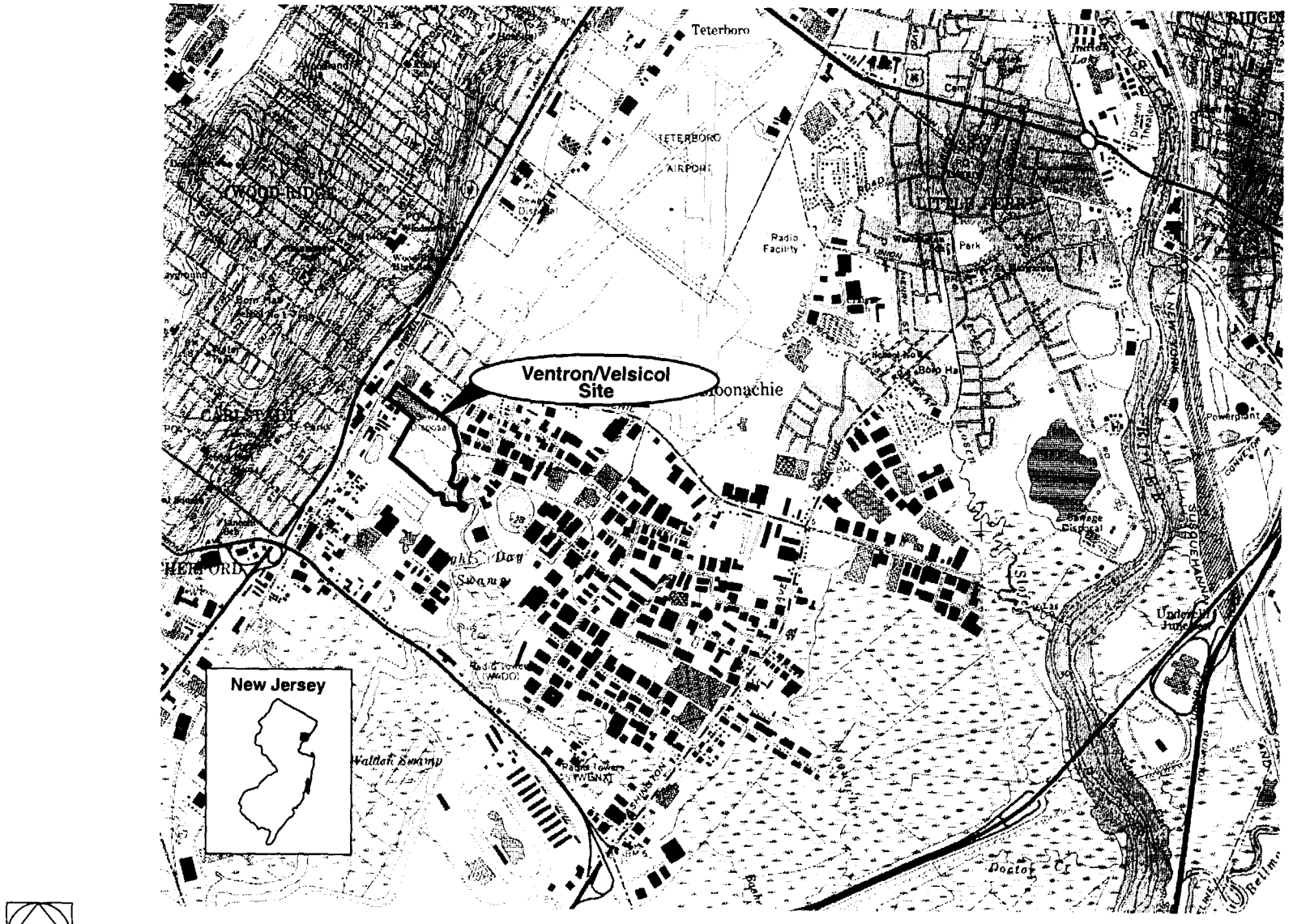
The Site is bordered to the east by Berry's Creek, to the west by the Diamond Shamrock/Henkel and Randolph Products properties, to the south by the Diamond Shamrock/Henkel ditch (south) and Nevertouch Creek, and to the north by Ethel Boulevard and a railroad track. A July 20, 1967 property survey map prepared by Frank W. Kuestner Associates shows that Burkhardt Paper Mills, Inc., formerly owned the Diamond Shamrock/Henkel property and that Pilot Laboratories, Inc., formerly owned the Randolph Products property. Two active commercial/industrial facilities and an empty lot on which a publicly owned treatment works (POTW) was formerly located lie immediately north of Ethel Boulevard and the railroad tracks. The railroad crosses Berry's Creek at the northeast corner of the Site and continues south along the east side

of Berry's Creek. Land use east of the railroad tracks on the east side of Berry's Creek is commercial/industrial. Teterboro Airport is located approximately 0.6 miles to the north, State Highway 17 is located approximately 500 feet to the west, and the Meadowlands Sports complex is located approximately 1 mile to the south. All immediately adjacent properties have commercial or industrial development. One immediately adjacent property, the Diamond Shamrock/Henkel property, has an active remediation program under the New Jersey Department of Environmental Protection (NJDEP) Environmental Cleanup Responsibility Act (ECRA). The closest residential area is approximately 750 ft to the north. Figure 2-1 shows the Site location and Figure 2-2 shows the Site layout.

Two active warehouses, referred to as the Wolf and the U.S. Life Insurance Company (U.S. Life) warehouses, are located on the northernmost portion of the Site. The Wolf Warehouse is east of the U.S. Life Warehouse. This portion of the Site covers approximately 7 acres and will be referred to as the "developed" portion of the Site. The former mercury processing facility was located on the portion of the Site that is now occupied by these warehouses.

Approximately 19 acres of land that were filled but not developed lie generally south of the developed portion of the Site. This area will be referred to as the "undeveloped filled" portion of the Site. While not developed, this portion of the Site has been substantially disturbed, as discussed in Section 2.4 and in ERM (1985).

The remaining 12 acres of the Site, south of the undeveloped filled area, do not appear to have been filled and are generally marsh, except for a fringe of fill along the western border. There is no development within this portion of the Site, which will be referred to as the "marsh" portion of the Site. There have, however, been disturbances to the marsh, as discussed in Section 2.4.



Base map source: USGS Weehawken, NJ-NY quadrangle

Figure 2-1. Site location map.

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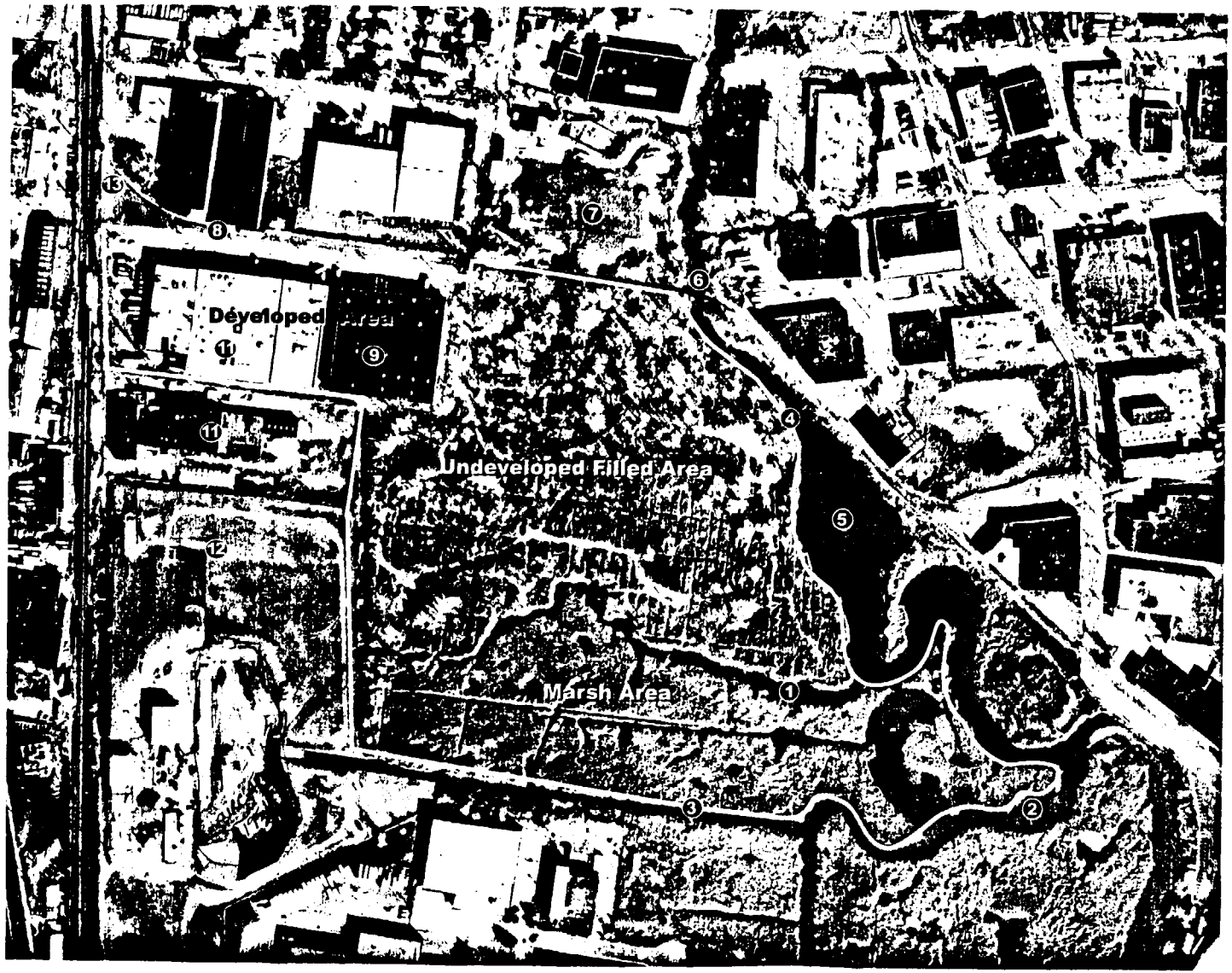


Photograph source: James Stewart, Inc. (November 29, 1997)

LEGEND

1. Diamond Shamrock/Henkel ditch (north)
2. Nevertouch Creek
3. Diamond Shamrock/Henkel ditch (south)
4. Tide gate
5. Berry's Creek
6. Railroad bridge
7. Former POTW
8. Ethel Boulevard
9. Wolf warehouse
10. U.S. Life warehouse
11. Randolph Products
12. Diamond Shamrock/Henkel Property
13. Park Place East

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-2. Site layout map.

2.2 SITE HISTORY

In 1929, F.W. Berk and Company, Inc., (Berk) began to manufacture mercury products near the current location of the Wolf Warehouse. Available sources did not contain any information regarding Site development before 1929. Berk initially leased the land from the Carlstadt Development and Trading Company, but purchased the land in 1943. Berk continued to operate a mercury processing plant until 1960, when the corporation dissolved and the plant and property were sold to the Wood Ridge Chemical Corporation (WRCC), a wholly owned subsidiary of the Velsicol Chemical Corporation (Velsicol). Between 1952 and 1955, the Magnesium Elektron Corporation (a New Jersey corporation, formerly Melberk, Inc.) leased a portion of the property that included a structure known as the Zirconium Building.

Velsicol continued to operate the mercury processing plant until 1968, when the Ventron Corporation (Ventron), a predecessor to Morton International, Inc., (Morton), purchased WRCC and the approximately 7-acre parcel on which the mercury processing facility was located from Velsicol. Velsicol retained ownership of the rest of the Site property, later transferring ownership to NWI Land Management, Inc. Ventron operated the plant until closure in 1974. In 1974, the parcel of land where the manufacturing facility was located was sold to Robert and Rita Wolf (Wolf). Wolf demolished the mercury processing plant in 1974 and in 1975 subdivided this parcel and transferred title of the westernmost parcel to U.S. Life Insurance Company. Two warehouses were constructed, one on each parcel. A more comprehensive chronology is available in ERM (1985) and JMA (1977).

The main operations of the mercury processing plant included the manufacture of red oxide of mercury, yellow oxide of mercury, phenyl mercuric acetate, and other organic and inorganic mercury compounds. The plant also reclaimed mercury from both in-house and customer waste products (amalgams, batteries, thermometers, impure mercury, etc.). Other investigators assumed that operations at this processing facility were generally similar throughout its manufacturing history.

High levels of residual mercury contamination (see Section 3.3) were left in place beneath the two warehouses, and Lipsky *et al.* (undated) reported that an underground cutoff wall was constructed along one side of the property. JMA (1977) presents the following excerpt from a January 29, 1975 letter reportedly written by Mr. Thomas J. Scheil, P.E., on behalf of Wolf Realty that described a proposed cutoff wall: "Install a cutoff wall from the surface to, and at least 3 feet into, the impervious varved clay soil 10 to 20 feet below the surface. The wall should extend along the entire eastern and southern property lines. The southerly cutoff wall should extend at least 50 feet west of the westerly building wall." We have not been able to find reliable information regarding the dimensions, exact location, or construction of the wall.

Lipsky *et al.* (undated) reported that subsequent to 1960, the approximately 19-acre portion of the Site between the developed area and Berry's Creek was used as a dumping area for various material including demolition material and domestic solid waste. The record of property easements confirms use of the Site for municipal waste dumping by the Borough of Wood-Ridge (see Attachment A, Easements/Rights of Way Item 5). We have not been able to find reports confirming other disposal activities on the Site.

Information in the easements for properties on the Site (see Attachment A, Easement/ Rights of Way Items 3 and 5) suggests that two drainage pipes may have been installed on the undeveloped filled portion of the Site between the developed portion and Berry's Creek. One of these pipes was related to the Borough of Wood-Ridge waste disposal activities and the other was related to conveyance of WRCC effluent across property then owned by Velsicol Chemical Corporation. However, the exact location of these pipes is uncertain. Figures B-1, 2, and 3 (in Attachment B) and a figure in Item 5 of Attachment A, Easement/Rights of Way, (bound separately), show various locations for drainage pipes. The source, date, and origin of the information contained in Figure B-1, provided by NJDEP, are unknown.

NJDEP sources have indicated that there is anecdotal evidence that a drum reclaiming operation once operated in the northeastern portion of the Site.

2.3 LEGAL SITE DESCRIPTION

Throughout the history of the Site, portions of the original property were leased, sold, or had easements granted to various parties. These business transactions are not discussed in detail here, but those which occurred prior to 1975 are documented in JMA (1977).

The current owners of the land within the 40-acre Site are as follows:

Jerbil, Inc.:	Block 229, Tax Lot 10.01[A]; Borough of Wood-Ridge (approximately 4.2 acres)
Jonathan and Roni Blonde:	Block 229, Tax Lot 10.02[B]; Borough of Wood-Ridge (approximately 2.3 acres)
NWI Land Management, Inc.:	Block 229, Tax Lot 8; Borough of Wood-Ridge (approximately 9.5 acres) and Block 84, Tax Lot 5, Borough of Carlstadt (approximately 21 acres).

Attachment A (separately bound) contains the property deeds and known easements/right-of-way. The lots in Block 229 in Wood-Ridge are denoted here as 10.01[A] and 10.02[B] because some documents use 10.01/10.02 and others use 10A/10B. In Carlstadt, older references show different blocks and lot numbers than denoted here because Carlstadt has recently been renumbered. Note that there is a 1 acre discrepancy between the total Site area from the deeds (as listed above) and the total site area described in Section 2.1, which was estimated from the surveyed map developed as part of this RI/FS.

The U.S. Environmental Protection Agency (EPA) Superfund site identification number for the Site is 02C7, and the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) identification number is NJD980529879. The

EPA site name is the Ventron/Velsicol Site. The Site name as used in the 1984 Stipulation and Supplementary Order and in the 1996 resolution to the Stipulation and Supplementary Order, however, is the Wood-Ridge Site. The Ventron/Velsicol Site name will be used in this document and other documents associated with the RI/FS.

2.4 HISTORICAL AERIAL PHOTOGRAPH REVIEW

The six historical aerial photographs shown in Figures 2-3 through 2-8, dating from 1940 to 1974, illustrate the changes in the Site's physical and environmental settings during the last 34 years that the mercury processing plant was in operation. We were unable to locate a photograph earlier than 1940. These six photographs were chosen from among the many available photographs because they best demonstrate the progression of events at the Site and the surrounding area. Features were identified through examination and comparison of the photographs. A review of aerial photograph stereo pairs and color aerial photographs available at the NJDEP offices in Trenton provided additional insights to features identified in the six photographs presented here. Stereo pairs were available for the photographs in Figures 2-3 and 2-4. Photographs from similar time periods were available for Figures 2-5 through 2-8 and were used to confirm features identified in these figures. The EPA published an aerial photographic analysis of the Site in 1994 (U.S. EPA 1994), based on four historical photographs, including the photos shown in Figures 2-3 and 2-4.

Each of the six photographs is discussed separately below in chronological order beginning with the earliest photograph. Numbers in square brackets [x] refer to the numbers on the photographs in the figures.

2.4.1 April 6, 1940 (Figure 2-3)

This image is somewhat blurry, making it difficult to discern some of the Site details, but it is the only available photograph from this early period. An east-west-oriented line [1] south of the facility extends to Berry's Creek near the tide gate [2]. This line was identified as a probable drainage pipe in U.S. EPA (1994). Examination of the stereo pairs revealed that this line [1] is two parallel open ditches that run from Berry's Creek to a point south of the eastern edge of the facility. At this point south of the facility, the ditches divide. One branch [3] extends to the facility. The other branch [4] runs parallel to the northern property line between Randolph Products and the Site. Three additional ditches exist in this portion of the Site, possibly emanating from the dark shape just to the left of [4]. The ditch indicated as [5] on Figure 2-3 appears to be recently constructed and extends from mid-way along the northern Site boundary, joins with a parallel ditch [6] to the south, and discharges to Berry's Creek immediately south of [7]. Another ditch [8] runs approximately parallel to Berry's Creek from south of [7] to the drainage ditch indicated by [1]. Other features worth noting include the limited area occupied by facility development [10] and the area that appears to be unvegetated at the northwest corner of the Site and south of the POTW [7].

Vegetation in the portion of the Site north of the ditch indicated by [1] appears to differ from that south of the ditch, possibly indicating that the portion of the Site north of the ditch was filled before 1940. South of ditch [1], the Site appears to be marsh with a combination of natural drainage patterns and apparent ditches. Some of these ditches may have been related to mosquito control. The meandering of an unnamed creek [9] through the middle of the marsh area, flowing between the large basin on the Diamond Shamrock/Henkel facility [12] and Berry's Creek, is an example of an apparently natural drainage pattern, which stands in contrast to the straight channels that have been constructed. There is a large constructed channel [11] connecting the unnamed creek [9] with Nevertouch Creek. IT (1991) indicates that this ditch was used as a water inlet for the Diamond Shamrock/Henkel facility; it will be referred to as the Diamond Shamrock/Henkel ditch (south).

2.4.2 April 7, 1951 (Figure 2-4)

Several smaller buildings surrounding the original building were constructed since the 1940 photograph [1]. Examination of the stereo pair for this photograph revealed that the ditch [2] originating from the northeast portion of the mercury processing facility in this photograph was recently constructed and converges with a ditch that extends along the northeast side of the Randolph Product property to the southern corner of the mercury processing facility and from there to Berry's Creek [3]. This ditch system was not visible in the 1940 photograph (Figure 2-3) or a 1953 photograph of the Site (not presented here). The remnants of ditch [1] in Figure 2-3 can be seen about 100 ft south of ditch [3] in Figure 2-4. Two other ditches east of the facility [4, 5] are partially buried by fill material. In the southern portion of the Site, two ditches cross the Site boundary. One ditch [6] runs along the southern boundary of the Randolph's Products property and the second ditch [7] connects the Diamond Shamrock/Henkel facility with the Diamond Shamrock/Henkel ditch (north). Based on the white material in the shape of an alluvial fan (north of [7]), the ditch [7] may be a drainage ditch from the Diamond Shamrock/Henkel facility.

There is some evidence of debris [2] near the southeastern corner of the facility. In the undeveloped filled portion of the Site between the facility and Berry's Creek there is an area of recent fill [8] and an adjacent area to the west covered with fill material apparently of less recent origin. In the stereo pair image, the areas of fill appeared elevated relative to the remainder of the Site. This filled area is linked to the POTW by a direct access road. The small oxbow of Berry's Creek [9] visible in Figure 2-3, south of the tide gate [10], is no longer present. Berry's Creek north of the tide gate [10] is wider and has fewer bends than in the 1940 photograph (Figure 2-3). Along the unnamed creek, there are numerous light-tone patches. There is also an area with a similar tone just south of the unnamed creek, about midway across the Site [11]. This light-toned area

is larger and more prominent in the 1957 photograph (Figure 2-5), but is no longer visible in the 1962 photograph (Figure 2-6).

2.4.3 March 31, 1957 (Figure 2-5)

During the 6 years since the 1951 photograph was taken, the undeveloped filled area between Berry's Creek and the mercury processing facility appears to have been graded, and only very sparse vegetation exists in that area [1]. The mercury processing facility has been further developed, with the addition of a small building on the eastern side, a building in the western corner, and apparent modifications to some of the existing buildings. Disturbances in the undeveloped filled area continue near the eastern border of this area [2]. Near the middle of the Site, drainage ditches linking the unnamed creek with neighboring industrial facilities have been expanded or newly constructed [3]. An area of very light-toned material on the east side of the Diamond Shamrock/Henkel facility has encroached into the marsh portion of the Site [4]. This encroachment appears to have affected the unnamed creek, evidenced by a section of the creek [5] that has a color similar to that of the light-toned material east of the basin. The light-toned area south of the unnamed creek first noticed in the 1951 photograph (Figure 2-4) appears more prominent [6].

2.4.4 November 15, 1962 (Figure 2-6)

The railroad tracks along the northern boundary of the Site, and the railroad bridge across Berry's Creek, are now in place [1]. The location of the creek in the marsh area has been completely altered since the 1957 photograph, having been pushed southward to near its current location [2]. Also, a ditch between the Diamond Shamrock/Henkel facility and this creek (just south of [7]), has been constructed since the prior photograph (1957). IT (1991) indicates that this ditch was used by the Diamond Shamrock/Henkel facility as a water discharge channel; it will be referred to as the Diamond Shamrock/Henkel ditch

(north). An earlier photograph taken on April 12, 1961 also showed the creek in a location similar to that in Figure 2-5, suggesting that the changes happened in late 1961 or 1962. The vehicle tracks in the filled area and the marked change in the vegetation compared to the marsh region of the Site suggest that this activity is fairly recent. The ditches linking the neighboring facilities with the unnamed creek, noted as [6] and [7] in Figure 2-4, are no longer visible and water along the western boundary of the Site is now visible. A small basin, located directly east of the mercury processing facility [3], contains water. The ditches north of the creek visible in 1957 ([3] in Figure 2-5) are no longer visible, presumably having been filled. In the southwest corner of the site, the Diamond Shamrock/Henkel ditch (north) ([2], south of [7]) has been straightened.

There appears to be organized material storage in the northeastern part of the undeveloped filled area of the Site [4]. The organized storage material was identified as stacked pallets in the stereo pair image from April 12, 1961. South of this material storage area, between the access from Concord Road (a north-south road between the mercury processing plant and the POTW) [5] and Berry's Creek, there appear to be small buildings or trailers and several depressions filled with water. Access roads lead to this area from Concord Road [5] and from the eastern border of the POTW. The April 12, 1961 photograph also showed that a portion of the fill material southeast of the tide gate [6] was burning.

NE cont

West of the Site, the disturbed area that had encroached on the marsh area ([4] in Figure 2-5) has been regraded [7], and light-toned material covers much of the southern portion of the filled region bordering the Diamond Shamrock/Henkel ditch (north) [2]. A new basin has been constructed north of the larger basin at the Diamond Shamrock/Henkel facility property [8]. Water can be seen near this new basin.

At the POTW, the rectangular basins have been replaced by a circular tank [9]. Also, more development [10] can be seen on the opposite bank of Berry's Creek.

2.4.5 April 7, 1969 (Figure 2-7)

The small basin next to the mercury processing facility and the several nearby depressions that contained water in Figure 2-6 appear to have been filled. Only the outline of the basin is still apparent in the photograph [1]. An aerial photograph from 1966 (not shown here) indicated that the small basin still contained water then. Scattered debris can be seen throughout the undeveloped filled area and is especially noticeable near [2]. The area between [1] and [2] is very dark, in contrast to the rest of the undeveloped filled area. A later photograph from March 31, 1971 (not shown here) showed no signs of burning in this region, but the area was more densely vegetated than the rest of the filled area. A well-traveled access road [3] still links the undeveloped filled portion of the Site with Concord Road, and vehicle tracks appear throughout most of this area. A trailer stands along this access road [4]. A second trailer is visible near the access route to the Diamond Shamrock/Henkel facility [5]. Water is still visible along the western fence line as it was in Figure 2-6. North of the Site and west of the POTW, the land appears to have been somewhat regraded since 1962 [6].

The long, light-colored lineament which runs west from the tide gate [7] to the Diamond Shamrock/Henkel facility does not appear to be a physical feature of the Site. The feature is most likely a crease or scratch on the original photograph or negative.

2.4.6 December 20, 1974 (Figure 2-8)

In this photograph, the mercury processing facility has been demolished, and the foundation of the warehouse closest to Park Place East (U.S. Life Warehouse) is already in place [1]. (A photograph taken on April 11, 1974 [not shown here] showed the mercury processing buildings still standing.) Debris [2] can be seen scattered on the undeveloped filled portion of the Site, most notably in the northeastern portion of the Site along Berry's Creek. A color photograph taken August 20, 1972 showed activity, including the presence of three trailers and debris in this region of the Site. In that

photograph, the debris appeared to be stacked pallets. The debris [2] in Figure 2-8 may be remnants from that earlier activity. There is a fence between the former mercury processing facility area and the undeveloped filled area, and there is no obvious access to the undeveloped filled area from the former mercury processing facility. The roads in the undeveloped filled area are still linked with Concord Road [3] and remain virtually unchanged from previous photographs. The small basin has taken on a more trench-like appearance, although the original outline is still visible [4]. Vehicle tracks appear on the marsh portion of the Site [5]. These vehicle tracks extend from the Diamond Shamrock/Henkel facility through the marsh across to Berry's Creek. The purpose of the activity is not apparent. Access to the marsh can also be gained from Concord Road. Color photographs taken in 1972 and 1978 show that the vehicle tracks in the undeveloped, filled region link the yellowish-white material on the Diamond Shamrock/Henkel facility property [6] with deposits of the same color located throughout the area north of the Diamond Shamrock/Henkel ditch (north). The trailer [7] has been moved closer to the western Site boundary than in 1969. The parcel north of the Site and west of the POTW has been developed [8]. The prominent very light-toned vertical stripe north of the Diamond Shamrock/Henkel ditch (north) is a mark on the photograph.

2.5 PHYSICAL DESCRIPTION

2.5.1 Site Geology

The unconsolidated overburden beneath the Site consists of one anthropogenic and four naturally occurring units. These units are listed below, beginning with the shallowest unit and working downward:

- A surficial layer of fill, which is absent in the southern portion of the Site (the marsh area)
- Fibrous peat and silt with organic material

- Fine- to medium-grained gray sand
- Varved gray to red-brown silt
- Red-brown silty sand.

The bedrock beneath these overburden units is the Triassic-age Brunswick Formation. This formation consists primarily of red shale with sandstone beds.

Photograph source: Intera

LEGEND

1. Two parallel ditches
2. Tide gate
3. One branch of ditch (1)
4. Second branch of ditch (1)
5. Recently constructed ditch
6. Ditch parallel to (5)
7. Unvegetated area
8. Ditch adjacent to Berry's Creek
9. Creek
10. Mercury processing facility
11. Diamond Shamrock/Henkel ditch (south)
12. Diamond Shamrock/Henkel basin

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-3. April 6, 1940 aerial photograph.

Photograph source: Intera

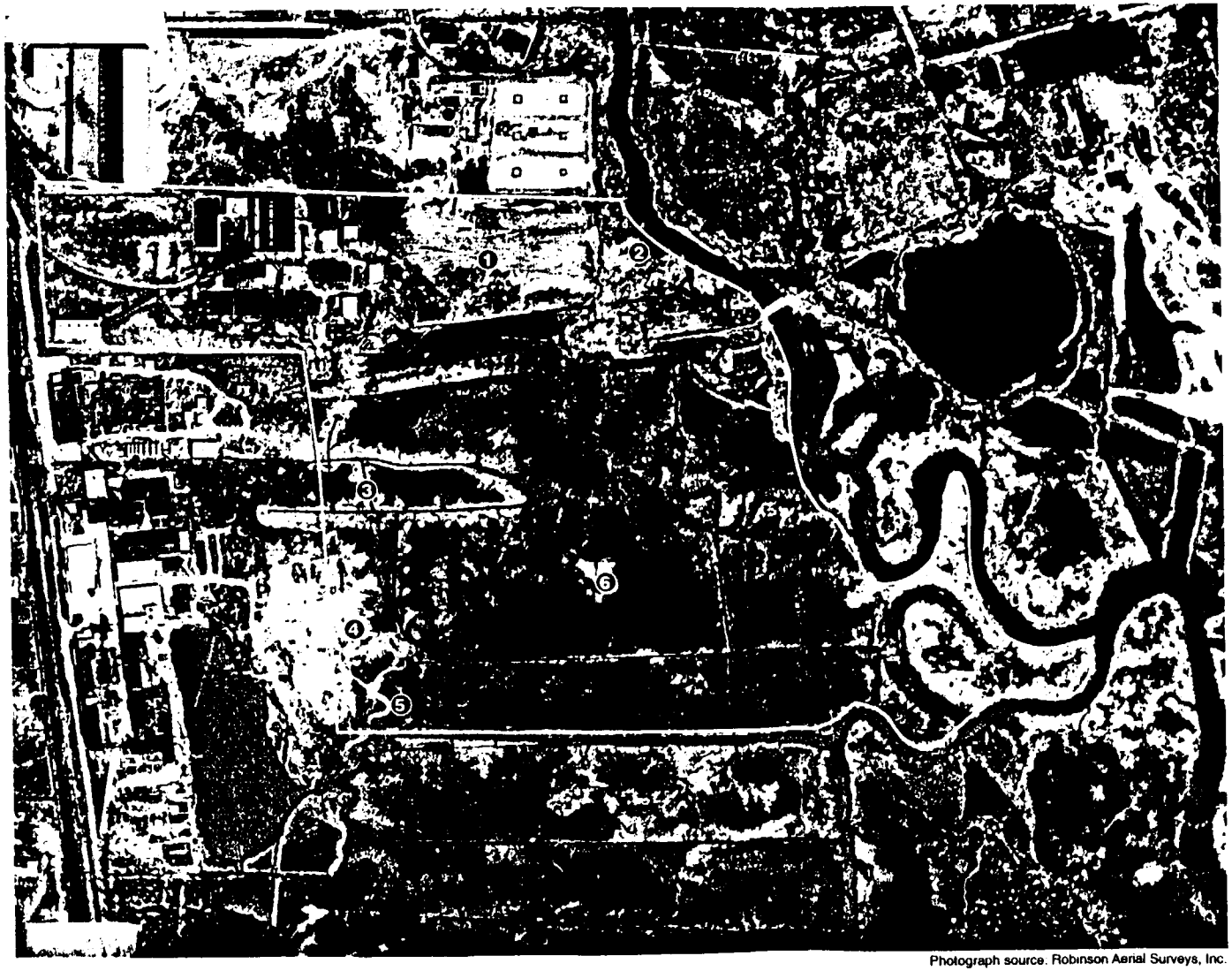
LEGEND

1. Mercury processing facility
2. Ditch, debris
3. Ditch
4. Ditch partially buried by fill
5. Ditch partially buried by fill
6. Ditch
7. Ditch
8. Recent fill
9. Former oxbow in Berry's Creek
10. Tide gate
11. Disturbed area

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-4. April 7, 1951 aerial photograph.



Photograph source: Robinson Aerial Surveys, Inc.

LEGEND

1. Regraded area
2. Disturbed area
3. Newly constructed ditches
4. Disturbed area
5. Section of creek
6. Disturbed area

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-5. March 31, 1957 aerial photograph.

Photograph source: Unknown

LEGEND

1. *Railroad tracks*
2. Diamond Shamrock/Henkel ditch (north)
3. Small basin
4. Organized material storage area
5. Access from Concord Road
6. Tide gate
7. Regraded area
8. Diamond Shamrock/Henkel basin
9. Circular tank
10. Increased development

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-6. November 15, 1962 aerial photograph.

Photograph source: Intera

LEGEND

1. Outline of small basin
2. Debris
3. Access road to Site
4. Trailer
5. Trailer
6. Disturbed area
7. Tide gate

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-7. April 7, 1969 aerial photograph.

Photograph Source: Unknown

LEGEND

1. U.S. Life warehouse (under construction)
2. Debris
3. Access from Concord Road
4. Small basin
5. Tracks in marsh area
6. Light toned material
7. Trailer
8. Newly constructed warehouse
9. Tide gate

Site boundary shown as white line

0 200 feet
approximate scale

Figure 2-8. December 20, 1974 aerial photograph.

The geologic units are described in more detail below. Descriptions of the overburden units provided below are based on the results of two previous geotechnical investigations performed for purposes of building foundation design (J.S. Ward 1974, 1975), the boring logs from the wells installed by the NJDEP in 1990, and the boring logs from the wells installed in 1977. The NJDEP boring logs are dated 1991 and referenced as NJDEP (1991). The 1977 well boring logs are presented in a report by Wayne R. Hutchinson called *Geohydrology of the Velsicol Site*, referenced as Hutchinson (1977). The geotechnical investigation by J.S. Ward (1974) covered the area on which the two warehouses are presently located, and the other investigation also by J.S. Ward (1975) covered the rest of the Site, including the marsh area, related to a proposed industrial park. The NJDEP (1991) and Hutchinson (1977) monitoring wells were only on the undeveloped filled portions of the Site. Soil classifications from boring logs in NJDEP (1991) and Hutchinson (1977) were less precise than those in the two geotechnical investigations and, hence, were not relied upon as heavily. A report by Woodward-Clyde (1982) also provides some information regarding geologic conditions in areas surrounding the Site. None of the reported investigations encountered bedrock at the Site; therefore, the description of bedrock presented here is based on information available from a published geologic map (Lewis and Kummel, 1910-12).

2.5.1.1 Surficial Fill Unit

A fill unit is present above the native geologic materials, except in the southern marsh portion of the Site. The fill unit consists of gravel, sand, silt, and clay with shale fragments, as well as glass, brick, cinders, porcelain, wire, leather, cloth, coal, chemical matter, wood, shingles, rubber, plastic, metal, and other debris (J.S. Ward 1974, 1975). Reported fill thickness ranges from a minimum of 2 ft in the vicinity of the Wolf and U.S. Life warehouses to a maximum of 21 ft at a location near the middle of the undeveloped filled portion of the Site. Fill thickness, most prevalently from 10 to 12 feet, in close proximity to this maximum value led J.S. Ward (1975) to speculate that a drainage channel had existed at that location prior to filling. Figure 2-4 shows a feature

that may have been a drainage ditch (south of marked feature [3]) passing through the general vicinity of the borehole where the maximum fill thickness was encountered. There are, however, two other nearby sample locations east of the 21-ft fill thickness location that have fill thickness of 17–19 ft, and many locations at which fill thickness was 14 ft or more. The thickest fill is found generally near the center of the undeveloped filled area. Fill thickness declines to 6–10 ft toward the north and west edges of the undeveloped filled areas, while fill thickness along Berry's Creek and the southern edge of the undeveloped filled area generally ranges from 10–16 ft. In the warehouse area, fill depths range from 2–5 ft. The eastern and southern boundaries of the surficial fill unit are defined by Berry's Creek to the east and a major drainage channel (referred to as the Diamond Shamrock/Henkel ditch [north] in Section 2.3) to the south.

2.5.1.2 Fibrous Organic Peat and Silt Unit

Fibrous organic peat and silt are present beneath the fill unit and at the ground surface in the marsh area of the Site, where fill was not deposited. This material is commonly referred to as "meadow mat." The meadow mat is generally 2.5–4 ft thick in the marsh part of the Site. Beneath the fill, its thickness ranges from 0.5 ft (J.S. Ward 1974) to no more than 2 ft (J.S. Ward 1975). This decrease in thickness, compared to areas that are not covered by fill, is likely because the meadow mat has been compressed by the weight of the fill (J.S. Ward 1975).

2.5.1.3 Gray Medium Sand Unit

A layer of moderately compact, fine- to medium-grained gray sand, approximately 5–10 ft thick, underlies the organic peat and silt meadow mat.

2.5.1.4 Varved Clay and Silt Unit

Immediately beneath the relatively thin gray medium sand unit is a varved gray to red-brown silt, which includes alternating sequences (1/16 to 1/2 in. thick) of clay- to sand-size particles (J.S. Ward 1975). The varved unit thickness ranges from approximately 62–146 ft (J.S. Ward 1974) and is the thickest sequence of unconsolidated overburden material encountered beneath the Site. Varved deposits are common in paleodepositional environments formed from glacial meltwater. Each pair of silt and clay layers represents one annual cycle of sedimentation/deposition within the glacial lake bed (Bloom 1978). The varved deposits below the site likely formed in Glacial Lake Hackensack during the Pleistocene Epoch (Woodward-Clyde 1982).

2.5.1.5 Red-Brown Silty Sand Unit

Immediately beneath the varved clay and silt unit is a red-brown silty sand unit that is at least 20 ft thick. This red-brown silty sand unit is the deepest unit encountered during earlier investigations. This unit is described as incompressible by J.S. Ward (1975). None of the boreholes on the Site penetrated below this unit.

2.5.1.6 Bedrock

Bedrock was not encountered in any reported Site boreholes. The deepest reported borehole at the Site was 172 ft deep (J.S. Ward 1974). Based on a review of available literature, and a geologic map of the area, the bedrock beneath the Site consists of the Brunswick Formation (also known as the Passaic Formation). The Brunswick Formation is of Triassic age and consists of sequences of non-marine origin, soft red shale with sandstone beds, and mudstone beds (Lewis and Kummel 1910–1912). The bedrock is commonly jointed and faulted by normal faulting, and the bedding planes within the formation generally dip 15 to 20 degrees to the northwest (Woodward-Clyde 1982). Strike is generally toward the northeast in this area (Lewis and Kummel 1910–1912).

2.5.2 Hydrogeology and Groundwater Classification

2.5.2.1 Hydrogeologic Conditions

The principal source of information on groundwater flow patterns at the Site is Hutchinson (1977). In the work reported by Hutchinson (1977), eight wells were installed, and three existing wells were also monitored. Water levels in these 11 wells were measured once daily during 5 days in June 1977, and were measured hourly over complete tidal cycles during 2 days in July 1977. Water levels were measured in the 15 wells (12 wells and 3 piezometers) installed in 1990 by NJDEP; however, information linking these measurements to Hutchinson (1977) could not be found.

Groundwater is present on the Site at depths ranging from approximately 2 to 8 ft below ground surface within the surficial fill unit (Hutchinson 1977; NJDEP 1991). Hutchinson (1977) indicated that groundwater in this fill unit generally flows outward in a radial pattern, centered in the southeastern portion of the undeveloped filled area. This pattern indicates that the water table is mounded in the fill unit. The number and locations of the wells, however, were not adequate to precisely define the location or shape of the mound. Based on the topography and general drainage patterns, the overall groundwater flow pattern in the region around the Site is expected to be toward the southeast and Berry's Creek. Groundwater flowing west from the mound in the fill unit is expected to eventually turn and rejoin the overall pattern of flow toward Berry's Creek. Shallow groundwater flow in the marsh part of the Site is likely toward the drainage ditches, which flow to Berry's Creek.

Hutchinson (1977) found that water levels in three of the wells located far inland from Berry's Creek were significantly influenced by tidal cycles, whereas the water levels in the other wells much closer to Berry's Creek and the tidally influenced drainage channels showed little tidal influence. Hutchinson (1977) attributed this phenomenon to the presumed presence of a drainage discharge connecting Berry's Creek with the areas in

which the wells that showed the tidal influence were located. Hutchinson (1977) showed the location of this drainage discharge as extending from the rear of the Wolf Warehouse (opposite side from Ethel Boulevard) in a generally southeast direction to Berry's Creek. Figure 2-4 shows a linear feature that may have been a drainage ditch in this location. This postulated former drainage discharge is approximately 100 ft northeast of the drainage ditch about which J.S. Ward (1975) speculated (see Section 2.5.1.1).

2.5.2.2 Groundwater Classification

The groundwater beneath the Site has been designated as a Class II-A aquifer, in accordance with the New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-6). The primary designated uses for Class II-A groundwater are potable water and conversion to potable water through conventional water supply treatment, mixing, or similar techniques.

Based on Site proximity to a tidally-influenced waterway, and the heavy industrial activities in surrounding areas, potable use of shallow-aquifer groundwater is unlikely at or near the Site.

The Site proximity to a tidally-influenced waterway (Berry's Creek) may cause groundwater to contain levels of chloride and total dissolved solids greater than those normally associated with potable water. The New Jersey Ground Water Quality Standards provide that groundwater that contains "natural or regional concentrations (through the action of salt-water intrusions) exceeding 3,000 mg/L chloride or 5,000 mg/L total dissolved solids" is designated Class III-B. The designated uses of Class III-B water include any reasonable uses other than potable water.

2.5.3 Surface Water Hydrology

2.5.3.1 Surface Water Drainage Patterns

The Site is located between a ridge to the northwest (see Figure 2-1) and tidal marshes of the Hackensack Meadowlands to the southeast of the Site. State Highway 17 is located near the toe of the ridge. Surface water drainage at the Site is generally to the southeast, where the Site is bordered by Berry's Creek. Three ditches drain the southern (marsh) part of the Site. One of these ditches (Diamond Shamrock/Henkel ditch [south]) is coincident with the Site's southwestern property boundary and flows into Nevertouch Creek, which then forms the southern Site boundary up to its confluence with Berry's Creek. The Diamond Shamrock/Henkel ditch (north), which marks the boundary between the undeveloped filled portion of the Site with the marsh portion, flows in a southeasterly direction into Berry's Creek. A third drainage ditch is roughly halfway between the other two. The marsh portion of the Site reportedly floods to a depth of up to 2 ft during high tide (J.S. Ward 1975).

Berry's Creek flows generally south from the Site vicinity in a 4-mile course through tidal marshes before joining the Hackensack River. Much of the stream course is curving. The stream flow in the last 1.25 miles of this creek has been diverted to a straight, man-made channel known as Berry's Creek Canal. The overall drainage pattern of the Hackensack Meadowlands is anastomotic (meandering and braided), which is common in tidal marshes (Bloom 1978). The mean tidal range where Berry's Creek Canal joins the Hackensack River is approximately 4.5 ft (HMDC 1982). The Hackensack River then flows southward into Newark Bay.

According to the New Jersey Surface Water Quality Standards, the waters of Berry's Creek are classified as SE2, indicating a saline (more than 3.5 parts per thousand total dissolved solids) estuary with the following designated uses:

A. Maintenance, migration, and propagation of the natural established biota
B. Migration of diadromous fish
C. Maintenance of wildlife
D. Secondary contact recreation
E. Any other reasonable uses.

2.5.3.2 Floodplain Maps

Figure 2-9 shows a map of Berry's Creek next to and downstream of the Site, identifying areas of 100-year and 10-year floods. This figure was adapted from the "Chemistry and Hydrology of Current and Post-Dredging Mercury Distributions" section in the Berry's Creek Report (Woodward-Clyde 1982). Figure 2-9 illustrates that the marsh area and much of the developed area of the Site are within the 10-year flood zone. The remainder of the developed area and portions of the undeveloped filled area are within the 100-year flood zone.

2.5.3.3 Historical Changes in Drainage Patterns

Changes in Site drainage patterns were discussed in Section 2.4.

2.5.4 Current and Future Land Use for the Site and Surrounding Areas

At present, the Site is zoned for light industrial use. HMDC governs zoning for the portion of the Site within the Borough of Carlstadt, while the Borough of Wood-Ridge maintains its own jurisdiction over zoning. Future land use planning for the Borough of Carlstadt portion of the Site is currently under development in the Special Area Management Plan. The plan will present criteria to guide future land use and to support HMDC's new Master Plan (EPA & ACOE 1995).

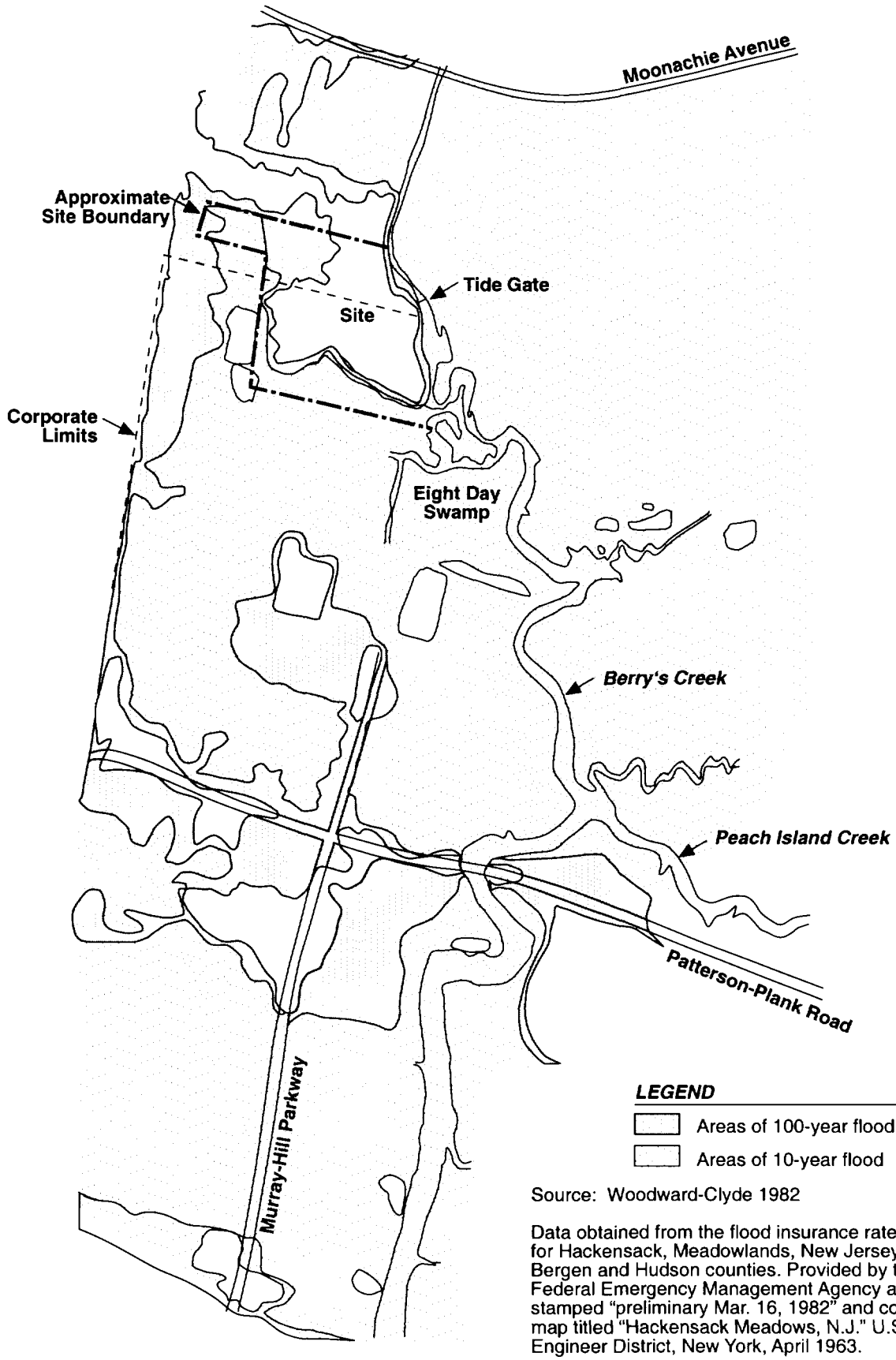


Figure 2-9. Floodplain map.

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2.6 ECOLOGICAL DESCRIPTION

2.6.1 Vegetation Cover Types

The description of vegetation cover types reflects conditions at the Site during a May 22, 1997 Site reconnaissance visit.

2.6.1.1 Wetlands

Wetlands delineation was conducted during the 1997 field season. The wetlands delineation report was prepared and submitted as a separate document (Shisler 1997).

2.6.1.2 Upland Vegetation Types

Upland vegetation covers the undeveloped filled portions of the Site. Plant species present are primarily non-native, weedy, and characteristic of urban regions, as expected based on the disturbed nature of the property and its location in an industrial area.

Vegetation categories in the undeveloped filled area may be distinguished based on structure. Portions of the Site (mainly in the northern and westernmost areas) have an open canopy of trees, with herb and shrub layers present. Other portions of the Site (mainly in the southern and eastern areas of the fill) support annual herbaceous vegetation in open stands.

Trees in the open canopy include poplar, mulberry, choke cherry, locust, and tree-of-heaven. Older and larger trees reach estimated heights exceeding 75 ft. Vegetation beneath the tree canopy is dense and includes sumac, briar, wild rose and saplings, and a thick layer of herbaceous weeds.

Open stands of annual plants are dominated largely by common reed (*Phragmites* sp.). When mature in late summer (as indicated by the presence of stalks from the previous year), reed height exceeds 10 ft.

Vegetation on the undeveloped filled portion of the Site is illustrated by photographs in Figure 2-10 taken in May 1997. Figure 2-10, photograph a, shows a canopy of relatively small tree-of-heaven with a weedy herbaceous layer. This photograph was taken in the northeastern quadrant of the undeveloped filled area of the Site. Figure 2-10, photograph b, taken close to photograph a, shows an area without a canopy of trees, with dense early-season growth of annuals, including common reed.

2.6.2 Wildlife

The ecological isolation and disturbed nature of the Site affect its wildlife resources. Primary local land uses are industrial, and a substantial transportation infrastructure is present (a railroad bed adjoins the Site, and municipal roadways and a state highway are present within a few hundred yards). As shown in the aerial photograph review (Section 2.4), the Site was significantly disturbed through filling, regrading, vehicular traffic, ditch construction, and material disposal from 1940 through 1974. Common urban species of mammals (e.g., woodchuck, Norway rat, opossum, cottontail, and muskrat) are present.

Resident birds are characteristic of human-influenced landscapes. Species include red winged blackbird, robin, common grackle, starling, English sparrow, mourning dove, mockingbird, catbird, and blue jay. Migratory species, including a number of wood warblers and flycatchers, were observed onsite in the spring of 1997. Under baseline conditions, individual migrants likely are present for a few days to weeks in the spring and autumn. Other birds characteristic of the Hackensack Meadowlands as a whole may be present as transients. Herons, egrets, hawks, sandpipers, and plovers may be expected

a. Canopy of relatively small tree-of-heaven with a weedy herbaceous layer.

b. Area without a canopy of trees, with dense early season growth.

Figure 2-10. Site visit photographs, May 1997.

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to forage in the Site vicinity, although nearby human activity probably restricts such foraging.

We have reviewed list of endangered, threatened, rare, or uncommon species for the Site vicinity from the Natural Heritage Program, which will be included with the ecological risk assessment report for the remedial investigation. In general, the species on that list could be present where suitable habitat exists. Based on the observations during the field reconnaissance, however, endangered, threatened, rare, and uncommon species are not likely to be present on the Site. No wildlife management areas have been identified in the immediate vicinity of the Site. This information will be confirmed in the problem formulation phase of the ecological risk assessment, through consultation with HMDC and state natural heritage program personnel.

3. NATURE OF THE PROBLEM

Key issues in defining the nature of the problem include the types of contaminant sources, methods and locations of contaminant release, behavior of contaminants in the environment, current Site conditions, and potential exposure to human and ecological receptors. The nature-of-the-problem description here is focused on Site risk issues, specifically on pathways linking contaminant sources and receptors of potential concern. Other types of issues, such as how the physical characteristics of materials disposed of onsite may influence potential remedies, will be dealt with in the feasibility study after the Site risks are well understood and requirements for Site remedies are known.

Relatively little information is available on the specific sources of Site contamination. The historical aerial photograph review clearly indicated substantial historical activity on the Site. The patterns of activity suggest links with the neighboring industrial and waste treatment operations, but we are not aware of any records that specifically characterize hazardous material disposal on the Site. Records of materials handled at the Site, or of activities on neighboring sites, are similarly limited. Mercury was known to be processed at the onsite facility, but no records are available of other materials being handled at the facility. Existing Site characterization data indicate the presence of hazardous substances on the Site, but given the lack of specific information about the releases to the Site, the patterns of occurrence for these substances cannot be correlated with any specific known releases to the Site.

The approved work plan for this RI/FS (CRA 1996) reflects this lack of knowledge regarding specific known releases. The planned soil sampling patterns are designed to provide broad coverage of the entire Site, with chemical analysis for a wide range of analytes. Further, the available Site history information is not sufficient to be the sole basis for choosing locations for subsurface investigation (trenching). Therefore, the trenching locations will be chosen based on a combination of the geophysical survey results and the Site history.

Despite the limited available information, it is useful to develop an initial conceptual model of the nature of the problem. In developing this initial conceptual model, we have combined information from a May 22, 1997 Site reconnaissance visit, prior Site investigation reports, and historical aerial photographs.

Figures 3-1 and 3-2 summarize the preliminary conceptual site model. These figures illustrate pathways of potential concern between the original releases of substances of potential concern (SoPCs) and human or ecological receptors. As can be seen from the figures, most potential exposures are mediated through onsite soils. Additionally, the potential for direct exposure to exposed drums, debris, and the onsite basin is shown. In Figures 3-1 and 3-2, the *Visitors* category is for occasional casual Site use, such as an individual who walks through the Site. *Site Workers* refers to persons who work in areas such as in the warehouses, but do not enter the undeveloped portion of the Site as part of their work duties. *Utility Workers* include workers who may need to construct or work in temporary trenches on the Site.

Current observed Site conditions, known and suspected sources of Site contamination, contamination reported in prior studies, potential contaminant transport pathways, and potential human and ecological receptors are discussed further below.

3.1 CURRENT OBSERVED SITE CONDITIONS

Two Exponent scientists conducted a Site reconnaissance on May 22, 1997, to evaluate current Site conditions. This reconnaissance activity included only visual observations; it did not include any sample collection or other intrusive activity. The visit was documented through field notes and photographs, some of which are reproduced here.

The Site surface currently includes a variety of conditions and covers, including buildings and pavement (in the developed portion of the Site), upland vegetation, marsh vegetation, open water, exposed rubble fill, a pit with exposed empty drums, exposed debris of

where?

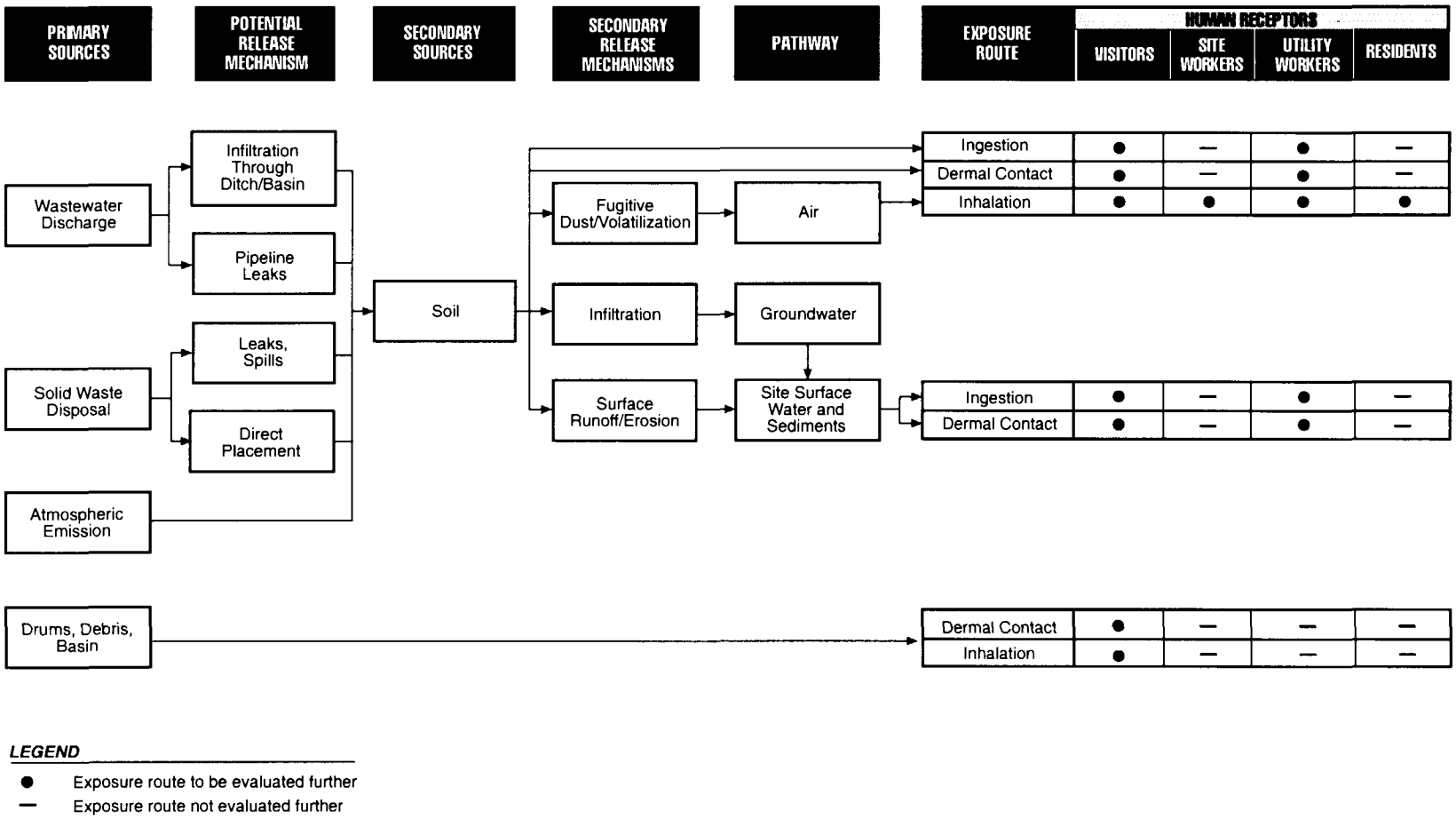

Figure 3-1. Preliminary conceptual site model, human health risk.

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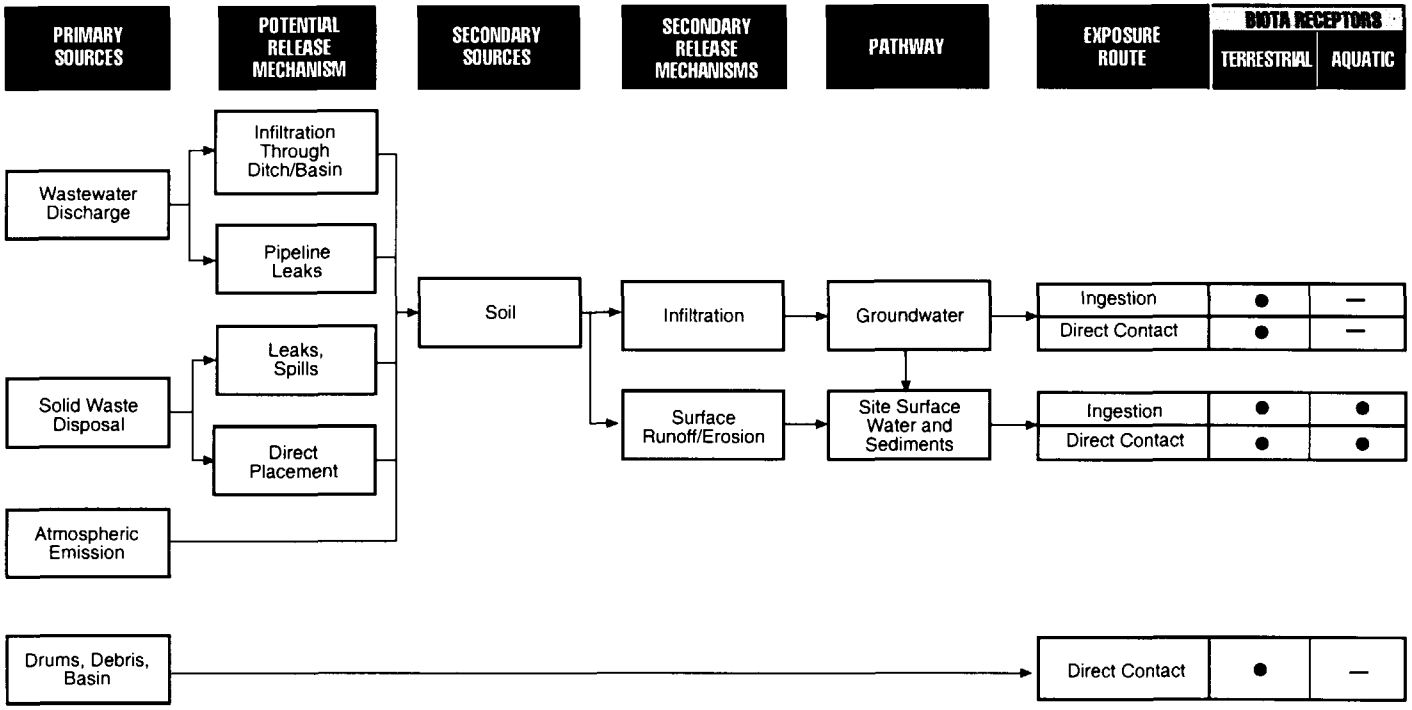


Figure 3-2. Preliminary conceptual site model, ecological risk.

varying types, and localized patches of stressed vegetation. Exposed debris is present in many parts of the undeveloped filled area. No exposed debris has been seen in the marsh portion of the Site. Typical views of the rubble are illustrated in Figure 3-3, photographs a and b. Smaller rubble and drum piles are found near the southeast border of the filled portion of the property (Figure 3-4, photograph a). Figure 3-4, photograph b, shows the pit with exposed empty drums.

Limited areas of vegetation stress are visible in undeveloped filled areas of the property. Two possible effects of stress were observed during the Site reconnaissance: standing dead trees and bare ground. Several small groves of standing dead trees, mostly tree-of-heaven, were observed. The size and apparent age of some of the dead trees suggest that they may have grown and died subsequent to the last known significant Site activity, around 1974. The cause of the dead vegetation is not known. Figure 3-5 illustrates a group of standing dead trees (Figure 3-5, photograph a).

Bare ground is present in a few locations that would appear to be suitable for growth of herbaceous vegetation. Figure 3-5, photograph b, shows such an area.

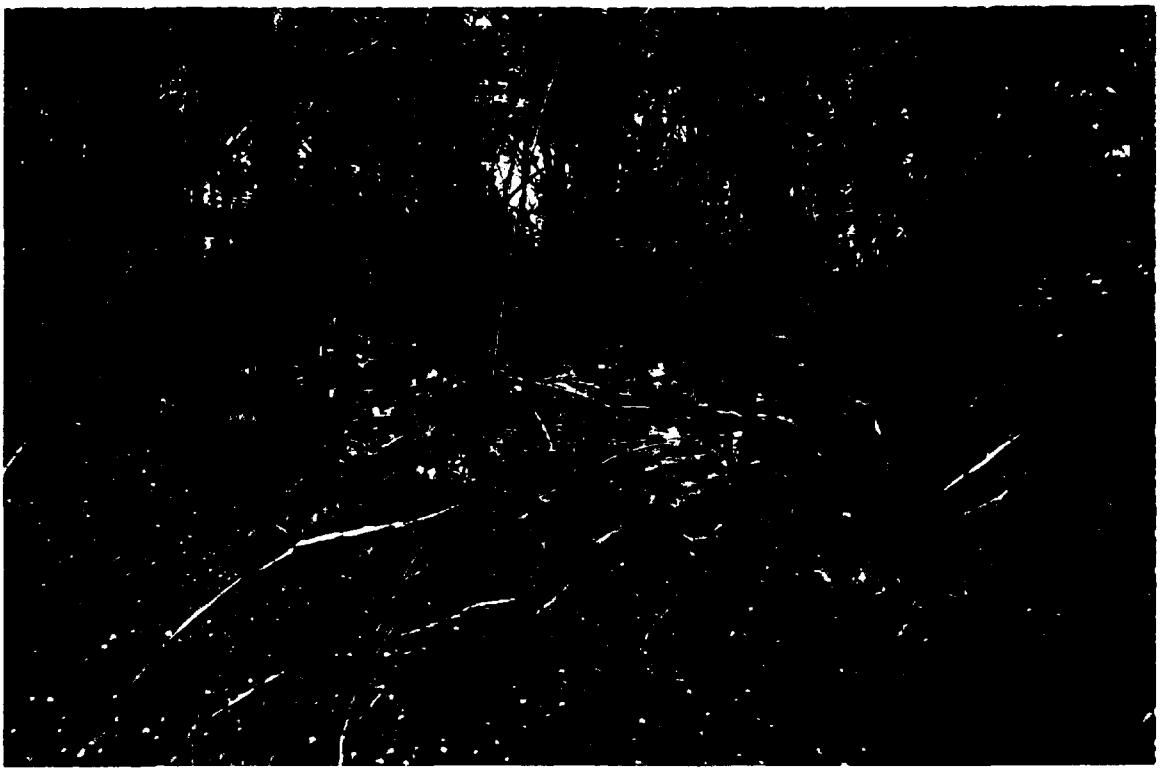
The Site is fenced along the northern and western boundaries. Southern and eastern borders adjoin marsh and waterways. In general, fenced areas of the property are densely overgrown with typical urban vegetation.

Human use of the Site appears to be limited to transients and trespassers. Two apparent squatter's shacks, built from site rubble, do not appear to be occupied at present.

3.2 KNOWN AND SUSPECTED CONTAMINANT SOURCES

As discussed above, little is known about specific contaminant sources. Some suspected sources of contamination from onsite and offsite sources are discussed below.

a. Rubble in undeveloped filled area.



b. Rubble in undeveloped filled area.

Figure 3-3. Site visit photographs, May 1997.

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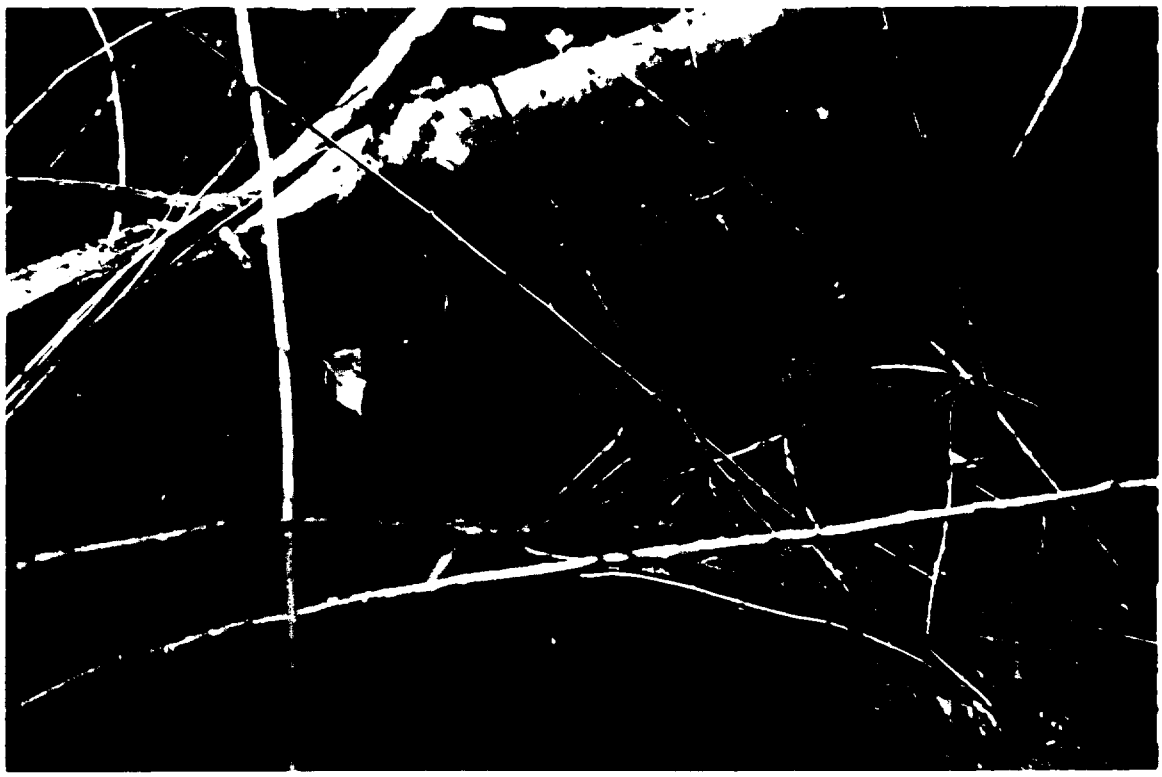

a. Smaller rubble and drum piles in undeveloped filled area.

b. Pit with exposed empty drums in undeveloped filled area.

Figure 3-4. Site visit photographs, May 1997.

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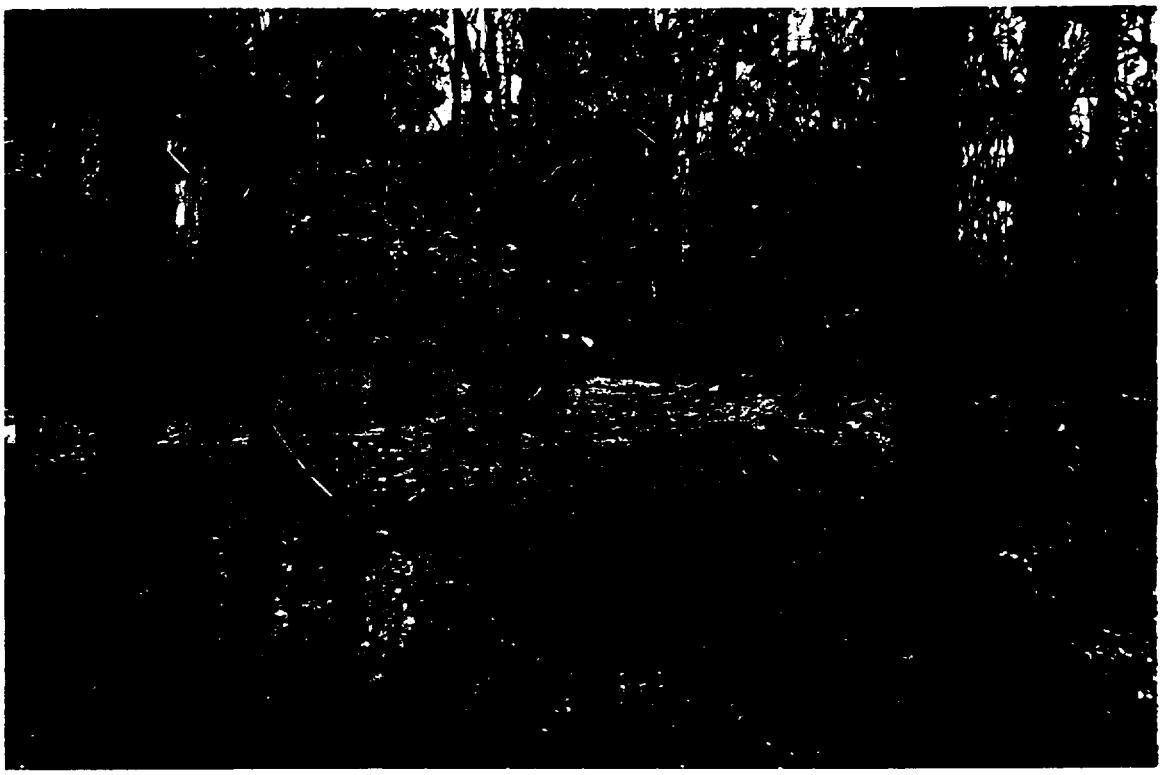
a. Group of standing dead trees.



b. Bare ground apparently suitable for growth of herbaceous vegetation.

Figure 3-5. Site visit photographs, May 1997.

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3.2.1 Onsite Sources

The only known potential source of contamination originating onsite is the former mercury processing facility. Suspected contaminant releases from this facility include the discharge of industrial wastewater across the Site before release into Berry's Creek, the disposal of facility wastes in the undeveloped filled portion of the Site, and atmospheric mercury emissions.

Wastewater effluent from the mercury processing operations was initially discharged through an open ditch, and later through a pipe, across the Site and into Berry's Creek. The record of easements (See Attachment A, Easements/Rights of Way Item 5) suggests that the pipe was installed sometime after 1968. Before completion of a primary treatment plant in February 1971, effluent from the mercury processing operations was estimated to contain 2–4 lb of mercury per day (ERM 1985). No estimates of how much of the mercury in the wastewater may have been released to the Site were found in the available reports. The effluent may also have contained other materials used at the mercury processing facility. Figures B-1 and B-2 (see Attachment B) show two different interpretations of the discharge location.

up to 1978

what about State v. Ventron Test Mer

We have not been able to find any direct reports of onsite waste disposal by the mercury processing facility, other than the effluent discharge discussed above. Lipsky *et al.* (undated), however, reported that subsequent to 1960, the approximately 19-acre portion of the Site between the developed area and Berry's Creek was used as a dumping area for demolition material, domestic solid waste, and industrial and chemical waste from the mercury processing plant. The domestic solid waste disposal is discussed further in Section 3.2.2. Also, JMA (1977) reported that on June 7, 1974, a discharge of chemicals evidenced by wetting of the demolition area was observed. ERM (1985) reported that the June 1974 discharge was oil. Plant demolition materials may also have been disposed of on the Site. The mercury in soils on the developed portion of the Site is most likely due to leaks, drips, and spills during the operation of the mercury processing facility.

We were not able to find any records of air emissions during the facility's operations. It is likely, however, that the facility air emissions contained mercury, some of which could have subsequently been deposited on the Site.

3.2.2 Offsite Sources

Activity patterns observed in the historical aerial photographs and in the limited available information about facility operations suggest that operations on at least three adjacent properties may have resulted in releases to the Site. The chemical nature of these suspected releases, however, is not known. These neighbors include the Diamond Shamrock/Henkel property, Randolph Products, and the former POTW. Specialty chemical products were manufactured on the Diamond Shamrock/Henkel property, beginning about 1921, and the Site is currently an NJDEP ECRA site with an active remediation system (IT 1991). We are not aware of any current activity on the Diamond Shamrock/Henkel property other than the remediation system. Randolph Products makes paints and other specialty chemicals and appears to be an active facility. Based on the aerial photographs, the POTW appeared to have been constructed before 1940, though the 1940 photograph (Figure 2-3) is too blurry to be conclusive. The POTW was recently demolished. Given the character of the surrounding area, the POTW probably received some industrial discharges.

Activity patterns observed in the historical aerial photographs suggest that materials from the Diamond Shamrock/Henkel property may have been discharged to and through the Site. Specifically, the activity patterns suggest that discharges from the Diamond Shamrock/Henkel property crossed the Site in unlined ditches, and sludge or other residue was deposited in the marsh area near the western border of the Site. Eder (1991) reports seeing a drawing which showed a drain outfall from the Diamond Shamrock/Henkel property to the Diamond Shamrock/Henkel ditch (north) at the southern edge of the undeveloped filled portion of the Site. Calcium sulfate (identical to the mineral gypsum) was among the waste products from the operations on the Diamond

Shamrock/Henkel property (IT 1991). This material could account for the light tones seen in the aerial photograph from 1957 (Figure 2-5). IT (1991) reported the presence of a wide variety of contaminants at levels of potential concern on the Diamond Shamrock/Henkel property, including volatile organic compounds, base/neutral and acid-extractable compounds, polychlorinated biphenyls, pesticides, petroleum hydrocarbons, and metals, including mercury. Surface water runoff, associated erosion, groundwater, and fugitive dust could have transported contamination from the Diamond Shamrock/Henkel property to the Site. The current groundwater treatment system on the Diamond Shamrock/Henkel property may intercept some of the groundwater flow from the Diamond Shamrock/Henkel property to the Site.

In the material reviewed by Exponent, the only report that contained information regarding Randolph Products was Laird and Fowler (1991). Laird and Fowler (1991) reported that Randolph Products discharged wastes across the Site through a ditch, and later through a discharge pipe, which continued to function after the mercury processing plant closed in 1974. They also reported that Randolph Products discharged to a settling basin on the Site for some time. The nature of these discharges was not reported. Based on the Randolph Products facility location, spills, surface runoff, and groundwater from the facility all flow toward the Site. Thus, any uncontrolled releases on or from the Randolph Products site may have contributed to contamination on the Site.

In 1960, WRCC granted the Borough of Wood-Ridge the right to dispose of municipal waste on an approximately 6-acre portion of the Site (see Attachment A, Easements/ Rights of Way Item 3). The agreement required the Borough to install a pipe in an existing drainage ditch. Observations from aerial photographs, discussed in Section 2.4, suggest that open burning also occurred on this portion of the Site. The property deed (see Attachment A) makes reference to the following adjacent properties: Pilot Laboratories, Inc., Burkhardt Paper Mills, Inc., and Panhard Oil Company. Section 2.1 discussed the locations of the Pilot Laboratories and Burkhardt Paper Mills properties. We do not at this time have further information about the properties, but the company names suggest that they could be potential contaminant sources.

Other sources besides those identified here may have contributed to groundwater contamination entering the Site on the upgradient boundaries. Additionally, tidal fluxes of water and sediment could transport contaminants from Berry's Creek onto the Site through the Site drainage channels and through seepage from Berry's Creek into Site groundwater.

3.3 TYPES OF CONTAMINANTS AND AFFECTED MEDIA

The primary SoPC for the Site is mercury. Tables 3-1 through 3-5 summarize all mercury data Exponent found for the area and media covered by the RI/FS work plan, except for the soil concentrations data in the developed part of the Site. Numerous soil samples from the developed portion of the Site were collected before the warehouses were constructed. According to JMA (1977), the most heavily contaminated soils from the U.S. Life Warehouse area were moved to the Wolf Warehouse area after the sampling had been conducted. This transport of soil from lot 10.01[A] to 10.02[B] is also documented in the deed for lot 10.02[B] (see Attachment A, Deeds Item 2). The specific sample locations and concentrations, therefore, are no longer meaningful. Sample concentrations prior to the relocation of Site soils were reported to range from 30 mg/kg to 200,000 mg/kg (JMA 1977).

means more Hg under Wolf

Some figures which illustrate the spatial distributions of mercury concentrations measured in prior investigations have been reproduced in Attachment B (bound with this report). Figures B-5 and Table B-1 show locations and mercury concentrations of soil samples from the Wolf property. These data were not incorporated in ERM (1988). We were not able to find comparable information for samples from the U.S. Life Warehouse. Figure B-6 (JMA 1977) shows soil mercury concentrations in the undeveloped portion of the Site. Figures B-7 and B-8 (ERM 1985) show the spatial distribution of soil mercury concentrations incorporating the data used to generate Figure B-6. Figures B-9 and B-10 show the spatial distribution of sediment mercury concentrations.

Other heavy metals and organic compounds have also been measured at elevated levels in soils, groundwater, and sediment. The *Nature of the Problem Final Report* (ERM 1985) summarizes Site data for mercury, heavy metals, and organic contaminants measured in soil and sediment, surface water, air, and groundwater from 1972 through 1984.

In 1990, NJDEP installed 12 groundwater monitoring wells and 3 piezometers, analyzing water samples from the wells and soil samples from the boreholes in which the wells were installed. This program provides the only Site data gathered after 1984 for compounds other than mercury. Soil and groundwater samples were analyzed for metals, including mercury, volatile organics, semivolatile organics, and pesticides/ polychlorinated biphenyls. The NJDEP wells are currently onsite and will be sampled during the RI/FS.

TABLE 3-1. MERCURY SAMPLING AND ANALYSIS SUMMARY - SOILS

Sampling Event	Sample Location	Sample Depth	Max. Station	Hg Concentration Range	Reporting Units	Reference
1990	Upland Soil	0-2 ft	MW-10	1.6-1,820	ppm	NJDEP 1993 (see Figure B-3 for station locations)
		2-4 ft	MW-02	19.1-549		
		4-6 ft	MW-05	0.44-287		
		6-8 ft	MW-03	0.27-217		
		8-10 ft	MW-06	ND-1,550		
		10-12 ft	MW-07	0.43-153		
		12-14 ft	MW-10	ND-18.1		
		>14 ft	MW-06	ND-115		
1977	Upland Soil (Top 24 in.)	0-6 in.	23S	5.7-2,558	mg/kg	JMA 1977 (see Figure B-4 for station locations)
		6-12 in.	23S	3.9-2,885		
		12-18 in.	23S	2.5-3,397		
		18-24 in.	23S	3.9-123,000		
1977	Upland Area (Soil borings)	0-2 ft	W6	1.5-2,592	ppm	JMA 1977 (See Figure B-4 for station locations)
		2-4 ft	W6	5.2-1,630		
		4-6 ft	W6	11.5-1,080		
		6-8 ft	W5	0.7-1.043		
		8-10 ft	W5	1.3-80		
		>10 ft	W4	1.1-1,069		
1976	Upland Area	NR	NR	20.4-11,640	ppm	U.S. EPA 1977
1976	Upland Area	Depth range: 0-17 in.	NR	3.3-5.6	ppm	NJDEP data as reported in JMA 1977

Notes: All soil concentrations reported in dry weight
Max Station - sample collection station at which the maximum concentration for the indicated sample depth was found. For example, in the first entry the concentration of 1,820 ppm was found at station MW-10.
See Section 3.3 for a discussion of mercury concentrations in the developed part of the site.
JMA - Jack McCormick & Associates
NR - not reported
NJDEP - New Jersey Department of Environmental Protection
ppm - part per million

TABLE 3-2. MERCURY SAMPLING AND ANALYSIS SUMMARY - SEDIMENT

Sampling Event	Sample Location	Sample Depth	Hg Concentration Range	Reporting Units	Reference
1993	Berry's Creek Adjacent to site	NR	65-3,380	mg/kg	Memphis Environmental Center 1993
1990	Berry's Creek Channel sediment Adjacent to site	0-8 in. 8-16 in. 16-24 in.	1,160 884 44.4	ppm	Eder Associates 1991
1986	Berry's Creek Channel sediment Adjacent to site	0-25 cm	82-576 (3-8 ppb MeHg)	ppm	Berman and Bartha 1986
	Unnamed Creek	0-25 cm	9	ppm	
1982	Berry's Creek Adjacent to site	0-1 in. 3-18 in. 18-30 in. 18-36 in.	65 9.2-700 1,700 6.3	ppm	Woodward-Clyde 1982
1980	Berry's Creek Adjacent to site	Surface Mid-depth Bottom	26 -1,100 11-1,100 2.4-410	mg/kg	AWARE 1980
1978	Berry's Creek Channel sediment Adjacent to site	0-4 in. 4-8 in. 8-12 in. 12-18 in.	276 807 1,142 1,392	ppm	HMDC 1978
	Berry's Creek Marsh soils Adjacent to site	0-2 in. 2-4 in. 4-6 in. 6-12 in. 12-13 in.	422 348 442 1,697 2,006	ppm	
1977	Berry's Creek Near site	Top 2 in. Bottom 2 in.	2-65.4 0.22-31.8	ppm	Hutchinson 1977

TABLE 3-2. (cont.)

Sampling Event	Sample Location	Sample Depth	Hg Concentration Range	Reporting Units	Reference
1977	Upland Ditch	0-3 in.	11.7-882	mg/kg	JMA 1977
		3-6 in.	23-695		
		6-9 in.	5.7-624		
		9-12 in.	1.2-528		
1977	Berry's Creek	0-3 in.	57-2,825	mg/kg	JMA 1977
		3-6 in.	24-39,940		
		6-9 in.	5.6-89,162		
		9-12 in.	14.7-66,533		
1976	Berry's Creek	At tide gate	577	ppm	EPA data as reported in
		0.2 miles downstream	4,480		JMA 1977
1975	Berry's Creek	At tide gate	35	ppm	EPA data as reported in
		0.2 miles downstream	0.3		JMA 1977
1975	Berry's Creek	Ventron discharge	165	ppm	NJDEP data as reported in
		150 ft below discharge	167		JMA 1977
		At tide gate	147		
1974	Onsite Basin		1.2	ppm	EPA data as reported in JMA 1977

Note: All sediment concentrations reported in dry weight
NJDEP - New Jersey Department of Environmental Protection
EPA - U.S. Environmental Protection Agency
JMA - Jack McCormick & Associates
NR - not reported
ppb - part per billion
ppm - part per million

TABLE 3-3. MERCURY SAMPLING AND ANALYSIS SUMMARY - BERRY'S CREEK SURFACE WATER

Sample Event	Sample Location	Hg Concentration Range	Reporting Units	Reference
1978	Adjacent to site (Station #8)	<0.1-12.7	ppb	HMDC 1978
June/July-77	Discharge point:	1.0-49.7	ppb	JMA 1977
	Upstream	0.5-12.8		
	Downstream	0.7-8.3		
August-76	1.2 miles upstream	0.20	ppb	EPA data as reported in:
	At tide gate	2.10		JMA 1977
	0.2 miles downstream	0.43		
November-75	1.2 miles upstream	0.30	ppb	EPA data as reported in:
	At tide gate	0.60		JMA 1977
	0.2 miles downstream	0.30		
February-75	At discharge	0.013	ppm(?)	DEP data as reported in:
	150 ft below discharge	0.30		JMA 1977
	At tide gate	0.0		
September-74	Run-off ditch	15.8	ppm(?)	EPA data as reported in:
	Upstream	0.001		JMA 1977
	Downstream	0.94		

Note: (?) - Reported values are inconsistent with reported units
JMA - Jack McCormick & Associates
ppb - part per billion
ppm - part per million

TABLE 3-4. MERCURY SAMPLING AND ANALYSIS SUMMARY - GROUNDWATER

Sample Event	Sample Location	Max. Station	Hg Concentration Range	Reporting Units	Reference
November-90	Upland Area	MW-07	1.9-4,110[a]	ppb	NJDEP 1993 (see Figure B-3 for station locations)
		MW-03	0.32-18.7[b]		
2-Jun-77	Upland Area[c]	NR	0.4-3,770[a]	ppb	JMA 1977
8-Jun-77	Upland Area[c]	NR	<0.1-1,077[a]	ppb	JMA 1977
13-Jul-77	Upland Area[c]	NR	<0.3-8.8[b]	ppb	JMA 1977

Note: JMA - Jack McCormick & Associates
NJDEP - New Jersey Department of Environmental Protection
NR - not reported
ppb - part per billion

[a] Total Hg concentration.
[b] Dissolved Hg concentration.
[c] These wells no longer exist.

TABLE 3-5. MERCURY SAMPLING AND ANALYSIS SUMMARY - AIR

Sample Event	Sample Location	Hg Concentration Range	Reporting Units	Reference
1990	Perimeter of the site	ND		NJDEP 1991
1989	Perimeter of the site	ND-720	ng/m3	NJDEP 1991
1978	Upland Area	17-3,922	ng/m3	NJDEP/U.S. EPA 1978

Note: EPA - Environmental Protection Agency
ND - not detected
NJDEP - New Jersey Department of Environmental Protection

Compounds other than mercury found during this NJDEP sampling event at concentrations above NJDEP screening criteria (see Section 4.2.2) include:

- Soil
  - Arsenic
  - Thallium
  - Zinc
  - Polychlorinated biphenyl Aroclors® 1242, 1248, and 1254
  - *bis*[2-ethylhexyl]phthalate

- Groundwater
  - Iron
  - Manganese
  - Sodium
  - Aluminum
  - Cadmium
  - Arsenic
  - Chromium (no speciation information)
  - Nickel
  - Zinc
  - DDT
  - 1,2-Dichloroethane.

Media potentially affected by Site contamination include the following:

- Onsite fill soils near disposal or discharge areas
- Surface water
- Sediment near seeps from fill soils
- Surface water and sediment in the onsite basin
- Sediment in onsite drainage channels
- Onsite biota
- Air
- Groundwater
- Offsite soil, surface water, sediment, groundwater, and air.

These media are all addressed directly by the planned sampling and analysis in the remedial investigation, except for onsite biota. The potential need for biota sampling will be evaluated as part of the remedial investigation.

In 1990, the NJDEP performed a removal action for soils in residential areas of Wood-Ridge and Moonachie near the Site. Information about this removal action presented here is taken from a report on an NJDEP briefing for local officials. The removal actions were conducted at 10 properties in Wood-Ridge and 1 property in Moonachie. The work included excavation of mercury-contaminated soil, placement of clean backfill, revegetation, and general restoration of the properties to their original condition. The remedial action criterion was 14 parts per million of mercury in soil. During this removal action, approximately 800 samples were collected.

3.4 RELEASE MECHANISMS AND POTENTIAL CONTAMINANT PATHWAYS

Figures 3-1 and 3-2 summarize potential release mechanisms and transport pathways for onsite contaminants. These potential transport pathways, which will be evaluated during the RI/FS, include the following:

- Leaching from soil to groundwater, with subsequent groundwater discharge into surface water
- Surface water runoff and erosion
- Fugitive dust and volatilization
- Direct contact with Site soil
- Direct contact with other onsite material.

Additionally, the Site may act as a source of contaminants to Berry's Creek through groundwater and surface water discharge, as well as erosion. The potential for the Site to be a source of contamination to Berry's Creek will be evaluated as part of the RI/FS.

3.5 KNOWN AND POTENTIAL HUMAN AND ECOLOGICAL RECEPTORS

3.5.1 Human Receptors

Because the HMDC and the Borough of Wood-Ridge have both assigned the Site a light industrial zoning classification, potential human receptors on the Site are limited to regular Site workers, utility or other short-term workers, and visitors/trespassers to the undeveloped areas of the Site. Both NJDEP and the New Jersey Department of Health have previously reported that exposure to unsafe levels of mercury vapor offsite due to onsite contamination is improbable (Lipsky undated). Planned mercury vapor monitoring, however, will determine the inhalation exposure potential from ambient Site air and from air inside the onsite warehouses.

Potential contaminant pathways for humans under current Site use conditions include inhalation of air and ingestion of and dermal contact with onsite soil and other onsite material. Available information indicates that groundwater at the Site is not used for potable supply. Furthermore, it is possible that natural chloride content of shallow Site groundwater would render it unfit for potable use under natural conditions. Exposure to SoPCs in sediments and biota in onsite surface water bodies is not considered a concern for human receptors, because there are no known recreational activities or fishing on the Site.

3.5.2 Ecological Receptors

Potential ecological receptors include the terrestrial and aquatic plants and animals resident on or otherwise using the Site. Specific risk endpoints and representative receptors will be selected as part of the ecological risk assessment.

4. PRELIMINARY IDENTIFICATION OF ARARs AND TBCs

The preliminary identification of potential ARARs and TBCs for the Site is based on current knowledge, as described in this document, and does not assume a need for any particular course of remedial action. Rather, ARARs and TBCs are identified on the basis of existing knowledge of the nature and extent of contamination and on the Site location.

4.1 BACKGROUND

ARARs are federal or state regulatory requirements against which response action alternatives are evaluated. The selected alternative must comply with ARARs, unless a waiver is obtained. ARARs are further defined as follows:

> An *applicable requirement* is a promulgated federal or state standard that specifically addresses a hazardous constituent, remedial action, location, or other circumstance at a site. To be applicable, the remedial actions or the circumstances at the site must be within the intended scope and authority of the requirement.
>
> A *relevant and appropriate requirement* is a federal or state requirement promulgated to address problems or situations similar to those encountered at a site, even though the requirement is not legally applicable.

Nonpromulgated federal and state standards and policies and guidance documents are not ARARs, but when relevant or appropriate to the Site, are TBC when evaluating response actions.

4.1.1 Substantive and Administrative Requirements

Onsite Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) response actions must follow the substantive requirements of ARARs, but are exempt from the administrative requirements. Offsite response actions, however, are subject to both substantive and administrative ARAR requirements.

EPA guidance (U.S. EPA 1988) defines substantive requirements as those that pertain directly to actions or conditions in the environment; for example, quantitative health- or risk-based restrictions on exposure to types of constituents. Drinking water maximum contaminant levels, technology-based requirements for response actions, and restrictions on activities in special locations are additional examples of substantive requirements.

Administrative requirements are defined as mechanisms that facilitate implementation of the substantive requirements of a statute or regulation. The approval of, or consultation with, administrative bodies, issuance of permits, documentation, reporting, and record-keeping are examples of administrative requirements.

4.1.2 Types of ARARs

There are three types of ARARs: chemical-specific, action-specific, and location-specific. Chemical-specific ARARs are requirements that govern concentrations of specific constituents, such as chemical-specific drinking water standards. These ARARs are generally triggered by the presence of specified compounds in environmental media. Action-specific ARARs are triggered by the type of response action under consideration. For example, National Pollutant Discharge Elimination System (NPDES) requirements may apply to discharges to surface water. Location-specific ARARs are triggered by the site location. A site near a wetland, for example, may be subject to wetland protection requirements.

TBC criteria include nonpromulgated policies, advisories, and guidances issued by the federal or state government, such as health effects assessments.

Potential ARARs and TBC criteria are identified by using the following steps:

- Review SoPCs, affected media, and current or potential future uses of the affected media to identify chemical-specific ARARs
- Review potential remedial action methods in relation to site-specific SoPCs to identify action-specific ARARs (will be done as part of the feasibility study)
- Review the site setting to identify location-specific ARARs.

4.2 CHEMICAL-SPECIFIC ARARs AND TBCs

Chemicals related to Site operations and detected most frequently or at the highest concentrations at the Site will be identified as SoPCs. Mercury is known to be a CoPC for this Site. Others may be identified during the remedial investigation. Potential federal, state, and local chemical-specific ARARs and TBCs are discussed below.

4.2.1 Federal

Table 4-1 lists potential federal chemical-specific ARARs and TBCs.

4.2.2 State and Local

The following New Jersey regulations contain chemical-specific criteria, and are, therefore, potential ARARs:

TABLE 4-1. POTENTIAL FEDERAL CHEMICAL-SPECIFIC ARARs AND TBCs

Act	Regulatory Citation	Prerequisite	Description	Applicable/ Relevant and Appropriate?	Comments
Safe Drinking Water Act (42 U.S.C. 300f *et seq.*)					
National Primary Drinking Water Standards (sect. 1412)	40 CFR 141	Public water systems	Establishes health-based standards for public water systems MCLs	No/No	Surface waters adjacent to the Site are used for public water supplies. There are no current or anticipated potable uses of groundwater for the Site.
National Secondary Drinking Water Standards (sect. 1412)	40 CFR 143	Public water systems	Establishes standards for the aesthetic qualities of public water systems (secondary MCLs)	No/No	Secondary MCLs are not federally enforceable but are intended as guidelines for the states.
Clean Air Act (42 U.S.C. 7401 *et seq.*, sect. 109)	40 CFR 50	"Major" sources of discharges to air	Establishes National Ambient Air Quality Standards	No/No	Treatment processes, if needed, could produce are emissions, but are not expected to qualify as "major" sources.
--	Soil Screening Guidance	NPL site	Establishes preliminary screening levels to help standardize and accelerate site evaluation	TBC	These criteria are focused on residential use and may not, therefore, be relevant to this Site.
Clean Water Act (33 U.S.C. 1251 *et seq.*, sect. 303)	Quality Criteria for Water as Amended	Waters of the United States	The criteria objectives are to restore and maintain the chemical, physical, and biological integrity of the nation's waters	TBC	Water quality criteria are non-enforceable guidances developed under the Clean Water Act and are used by states to establish water quality standards.

Note: -- - not applicable
MCL - maximum contaminant level
NPL - National Priorities List
TBC - to be considered

- The Safe Drinking Water Act (N.J.A.C. 7:10–16) contains numerical criteria (the state maximum contaminant levels) for drinking water
- The Ground Water Quality Standards (N.J.A.C. 7:9-6) define classes of groundwater and contain numerical criteria for contaminants in Class II-A groundwater
- The Surface Water Quality Standards (N.J.A.C. 7:9B-1.13) contain numerical criteria for contaminants in surface water
- The Ambient Air Quality Standards (N.J.A.C. 7:27B) contain numerical criteria for contaminants in air.

The NJDEP has also developed "interim-specific" criteria for certain compounds in Class II-A groundwater, as discussed in a memorandum for Mr. Rick Gimello, Assistant Commissioner of the NJDEP, dated February 5, 1997. The interim-specific criteria constitute chemical-specific TBC requirements for groundwater.

New Jersey has not promulgated chemical-specific criteria for soil or sediment. However, NJDEP uses the following guidance when evaluating soil and sediment data. This guidance includes the following:

- Proposed soil criteria regarding unrestricted use, restricted use, and impact to groundwater, issued by NJDEP in July 1996
- A document entitled "Final Draft Guidance for Sediment Quality Evaluations," issued by NJDEP in March 1991.

These documents are TBCs for soil and sediment.

4.3 ACTION-SPECIFIC ARARs

4.3.1 Federal

Table 4-2 summarizes potential federal action-specific ARARs and TBCs. This list is based on common ARARs for action at CERCLA sites. It is not based on any specific anticipated actions at the Site, because it would be premature to develop any suggestions regarding response actions at this phase of the RI/FS process.

4.3.2 State and Local

The following potential ARARs are applicable to the proposed Site investigation or may be applicable to remedial activities, depending on the remedial action selected. As with the federal ARARs and TBCs, these preliminary state and local ARARs and TBCs are not based on any specific anticipated actions at the Site.

- Technical Requirements for Site Remediation (N.J.A.C. 7:26E)
- Soil Erosion and Sediment Control Plan Certification for Land Disturbance Control (N.J.A.C. 2:90)
- Permit to Construct/Install/Alter Air Quality Control Apparatus/Equipment (N.J.A.C. 7:27-8)
- Certificate to Operate Air Quality Control Apparatus/Equipment (N.J.A.C.7:27-8)
- State Water Quality Certificate (N.J.S.A. 58:10A-1 to 13)
- Dewatering Permit and/or Water Diversion Permit (N.J.S.A. 23:5-29)

TABLE 4-2. POTENTIAL FEDERAL ACTION-SPECIFIC ARARs

Act	Regulatory Citation	Prerequisite	Description	Applicable/ Relevant and Appropriate?	Comments
RCRA (42 U.S.C. 690 *et seq.*)	40 CFR 260 through 40 CFR 270	Generation or management of hazardous waste	Establishes criteria for determining whether waste materials are RCRA hazardous wastes. Establishes design standards for hazardous waste piles, landfills, and other units.	TBD	Offsite removal or significant onsite relocation of materials will require evaluation to determine applicability of RCRA. Materials onsite are not thought to be listed wastes. Subtitle D does not apply because no waste was placed after October 9, 1991.
Rivers and Harbors Act, sect. 10	33 CFR 330	Dredging, filling, or related activities in streams and rivers	Establishes permitting requirements and standards for dredge and fill and cleanup activities in wetlands.	TBD	Regulations address activities involving dredging and filling in streams, cleanup in stream segments, or other construction activities that could affect wetland areas.
Clean Water Act, (33 U.S.C. 1251 *et seq.*, sect. 404)	40 CFR 230	Dredging, filling, or related activities in streams and rivers	Establishes permitting requirements and standards for dredge and fill and cleanup activities in wetlands.	TBD	Regulations address activities involving dredging and filling in streams, cleanup in stream segments, or other construction activities that could affect wetland areas.
Clean Water Act (33 U.S. C. 1251 *et seq.*, sect. 402)	--	Wastewater discharges	Establishes requirements for permitting and discharging wastewater to prevent and abate pollution of waters of the United States.	TBD	Regulations address discharge of waste water from point sources. Could apply if Site activities require that water is discharged to a stream.
Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*)	--	Water-related projects	Establishes requirements for consultation with federal agencies for projects in which natural resources could be affected.	TBD	Consultation is recommended, but not required, for onsite activity. Required for offsite activity.
Clean Air Act (42 U.S.C. 7401 *et seq.*, sect. 111)	40 CFR 50	"Major" sources of discharges to air	Establishes treatment technology standards for emissions to air.	TBD	Treatment processes, if needed, could produce air emissions, though they would not likely qualify as major sources.

Note: -- not applicable RCRA - Resource Conservation and Recovery Act TBD - to be determined

- Discharge Prevention and Discharge Cleanup and Removal Plans (Pertaining to Storage and Transfer of Petroleum and other Hazardous Substances (N.J.S.A. 58:10-23.11 et seq.; N.J.A.C. 7:1E)
- Registration of Underground Storage Tank; UST Installation Permit and Closure Approval (N.J.S.A. 58:10A-21 et seq.)
- Water Quality Management Plan Consistency Determination (N.J.S.A. 58:11A-1 et seq.; N.J.A.C. 7:15)
- New Jersey Pollutant Discharge Elimination System (NJPDES) (N.J.S.A. 58 10A-1 et seq.), including:
  - NJPDES - Discharge to Surface Water - Industrial (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A)
  - NJPDES - Significant Indirect User (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A)
  - NJPDES - Discharge to Ground Water (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7-14A)
- Treatment Works Approval (N.J.S.A. 58:12A-1 et seq.; N.J.A.C. 7:10-11)
- Sewer Connection Permit (N.J.S.A. 58:10A-1 et seq.; N.J.A.C. 7:14A)
- Landfill Disruption/Closure Approval (N.J.S.A. 13:1E-1 et seq.; N.J.A.C. 7:26-2.7)
- Hazardous Waste Facility Registration (N.J.S.A. 13:1E-1 et seq.; N.J.A.C. 7:26)
- Well Drilling Permit, and Well Certification Forms A and B (N.J.S.A. 58:4A-14; N.J.A.C. 7:8-3.11)

- Well Abandonment Forms (N.J.A.C. 7:9-9.1F)
- Hazardous Waste Generator Identification Number (N.J.A.C. 7:26).

In addition, the Boroughs of Wood-Ridge and Carlstadt may require fire, electrical, plumbing, and/or building permits, depending on the remedial action selected.

4.4 LOCATION-SPECIFIC ARARs

4.4.1 Federal

Table 4-3 summarizes federal location-specific ARARs. For this Site, location-specific ARARs include those regulations that may pertain to the streams and wetlands located near the Site. After results of the cultural resources survey are known, other location-specific ARARs may be identified.

4.4.2 State and Local

The following potential ARARs are applicable to the proposed Site investigation, or may be applicable during remedial activities, depending on the remedial action selected:

- Coastal Area Facility Review Act Permit (N.J.S.A. 13:19-1 et seq.)
- Waterfront Development/Upland Waterfront Permit (N.J.S.A. 12:5-3)
- Wetlands Permit (N.J.S.A. 13:9A-1)
- Freshwater Wetlands/Open Water Fill Permit (N.J.S.A. 13:98-1)

TABLE 4-3. POTENTIAL FEDERAL LOCATION SPECIFIC ARARs

Act	Regulatory Citation	Prerequisite	Description	Applicable/ Relevant and Appropriate?	Comments
Resource Conservation and Recovery Act (42 U.S.C. 690 *et seq.*)	40 CFR 264.18(b)	Management of hazardous waste within a 100-year floodplain	Waste management facilities must be designed to avoid adverse effects from flooding	TBD	
National Historical Preservation Act (16 U.S.C. 469)	36 CFR 65	Action that may cause irreparable harm to significant artifacts	Actions must be taken to recover and preserve artifacts	TBD	
National Historical Preservation Act (16 U.S.C. 470 *et seq.*), Sect. 106	36 CFR 800	Property included in or eligible for the National Register of Historic Places	Action must be planned to minimize harm to National Historic Landmarks	TBD	
Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*)	50 CFR 200, 402	Critical habitat upon which threatened or endangered species depend	Action must be planned to conserve threatened or endangered species	TBD	
Executive Orders 11988 (floodplain management) and 11990 (Protection of Wetlands)	40 CFR 6, Appendix A	Actions in floodplains or wetlands as defined in 40 CFR 6, Appendix A, Sect. 4(j)	Actions must be planned to minimize potential harm and preserve value of wetlands to the extent possible	TBD	
Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)	33 CFR 320-330	Actions that may affect natural resources	Establishes requirements for consultation with federal agencies for projects in which natural resources could be affected	TBD	
Clean Water Act (33 U.S. C. 1251 *et seq.*, sect. 404)	40 CFR 230, 33 CFR 320-330	Wetlands as defined by U.S. Army Corps of Engineers Regulations	Prohibits filling of wetlands without a permit	TBD	

Note: TBD – To be determined

- Stream Encroachment Permit (Construction Within a Flood Plain) (N.J.S.A. 58:16A-50 et seq.; N.J.A.C. 7:8-3.15)
- HMDC-Zoning Certificate (N.J.S.A. 13:17-1 et seq.).

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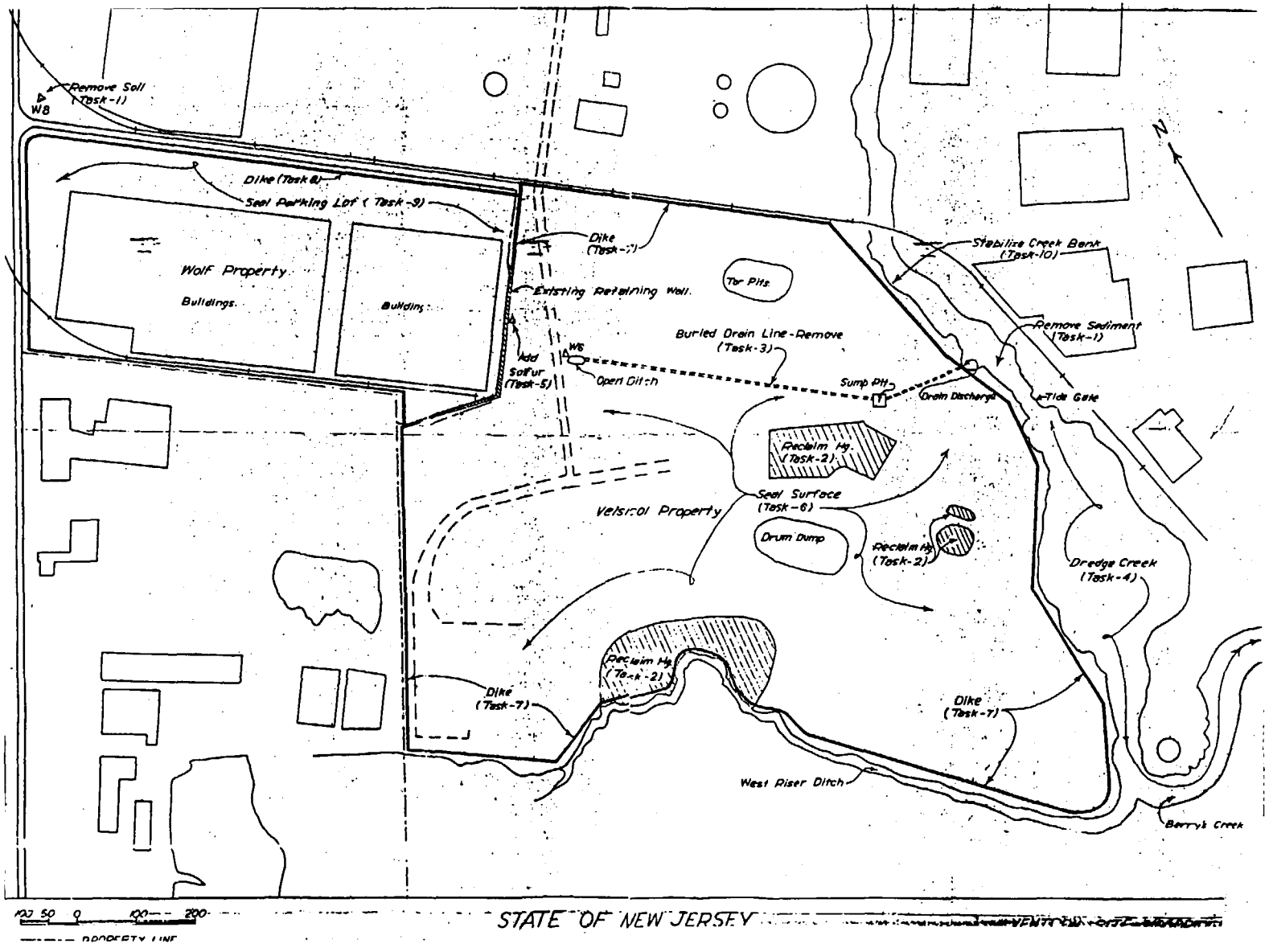
Attachment B

Historical Site Maps and Data Tables

LIST OF FIGURES

LIST OF TABLES



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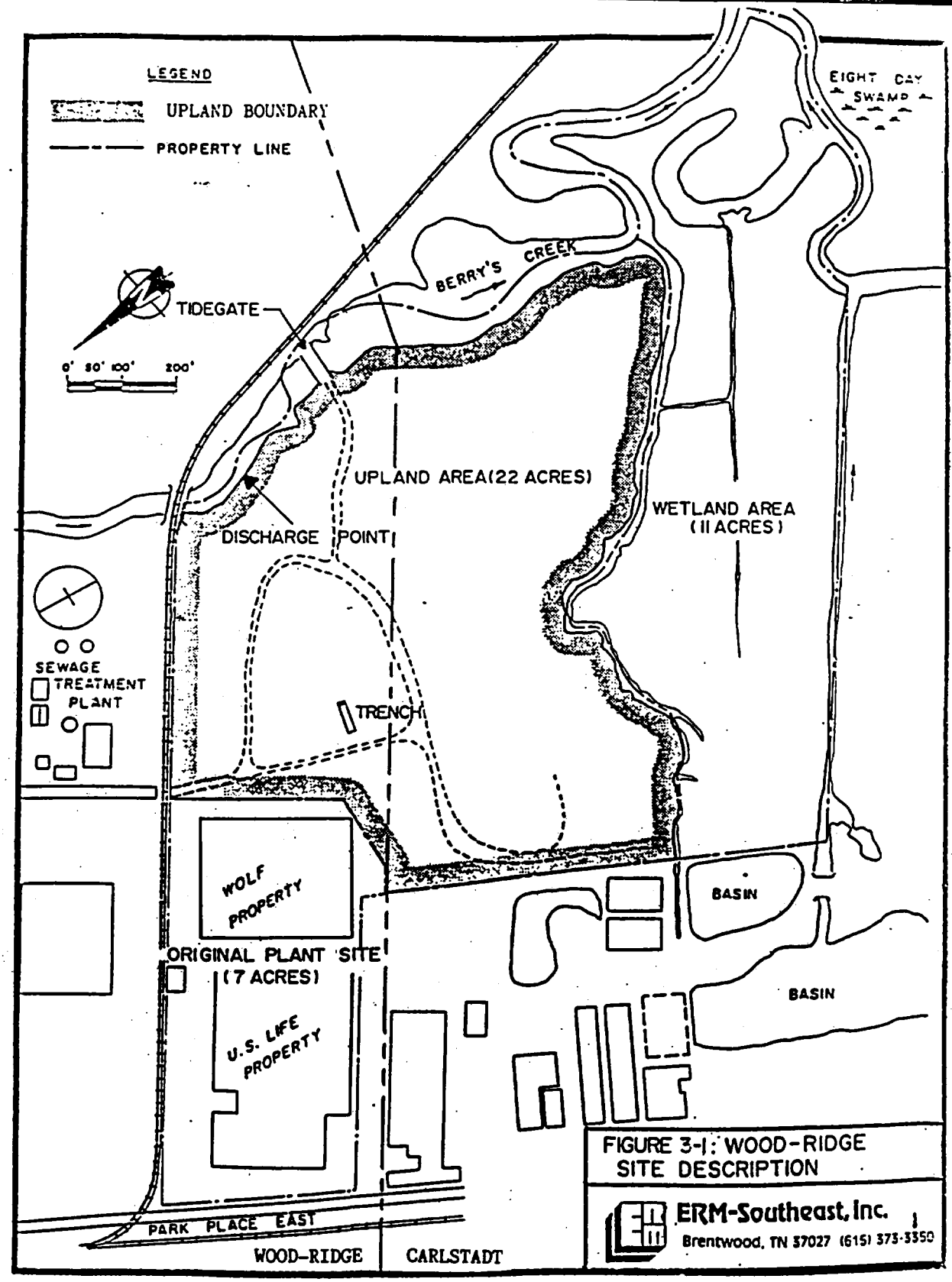


Figure B-2. ERM 1985.

831200084

8600B3N.001 0201 10/22/98 WA

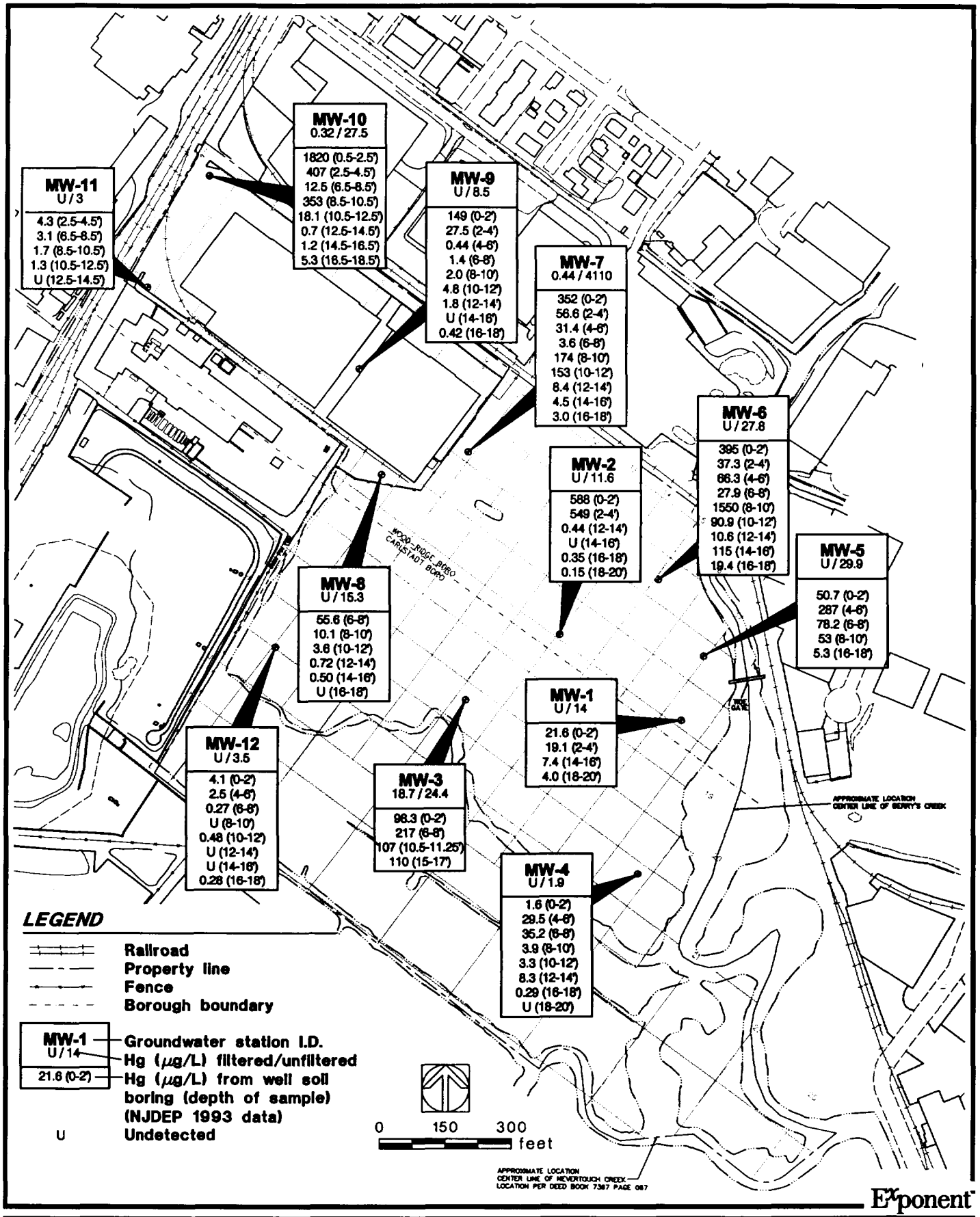
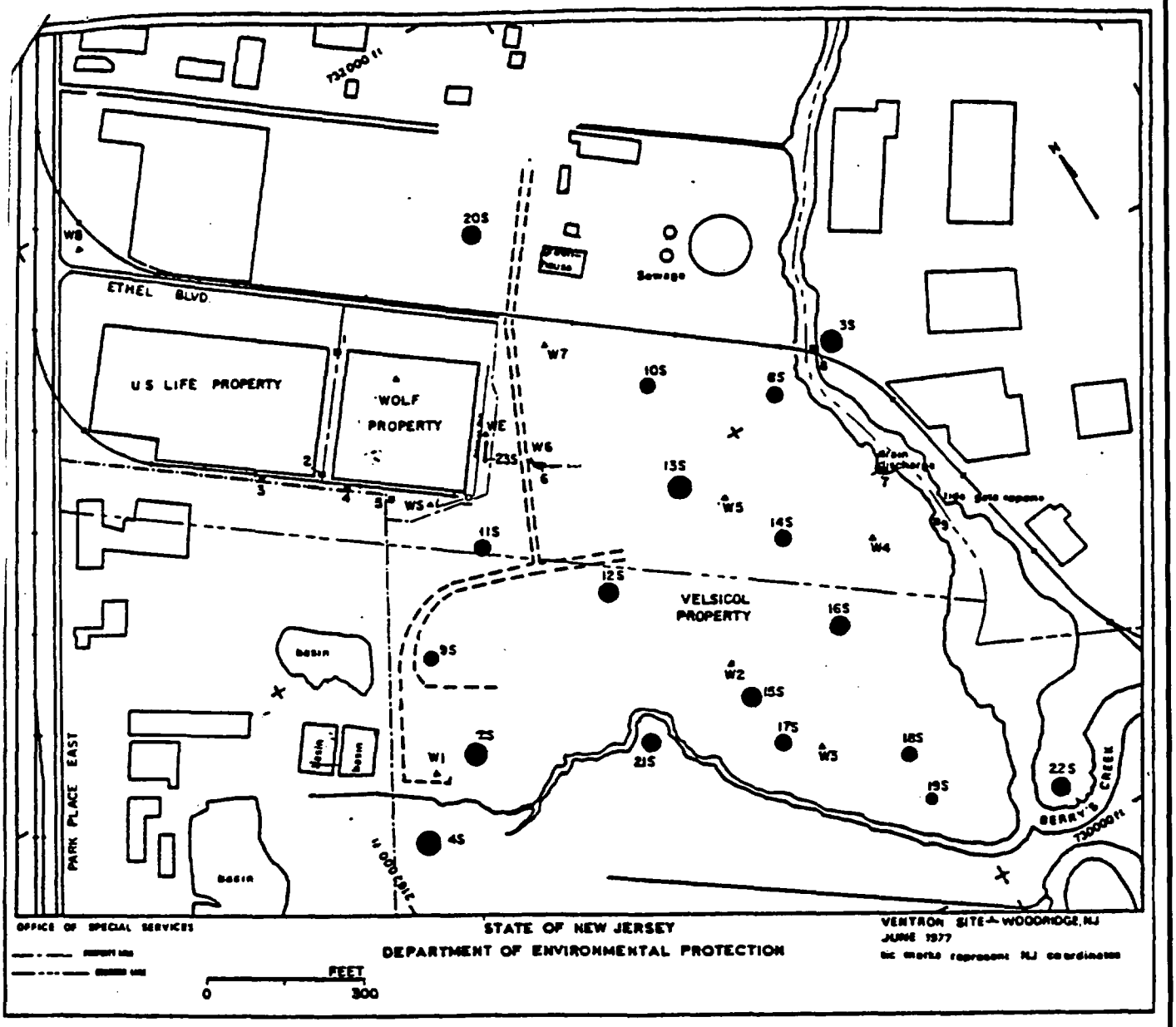


Figure B-3. Groundwater monitoring wells with groundwater and soil analytical reported by NJDEP (1993) at the Ventron/Velsicol Site.

CB3N0203\MERC93.dwg 11/18/98 OR



● Soil Station

▲ Observation Well

■ Surface Water Station

Figure 2. Locations of surface water stations, observation wells, and soil stations on and near the subject site.

Figure B-4. JMA 1977.

831200086

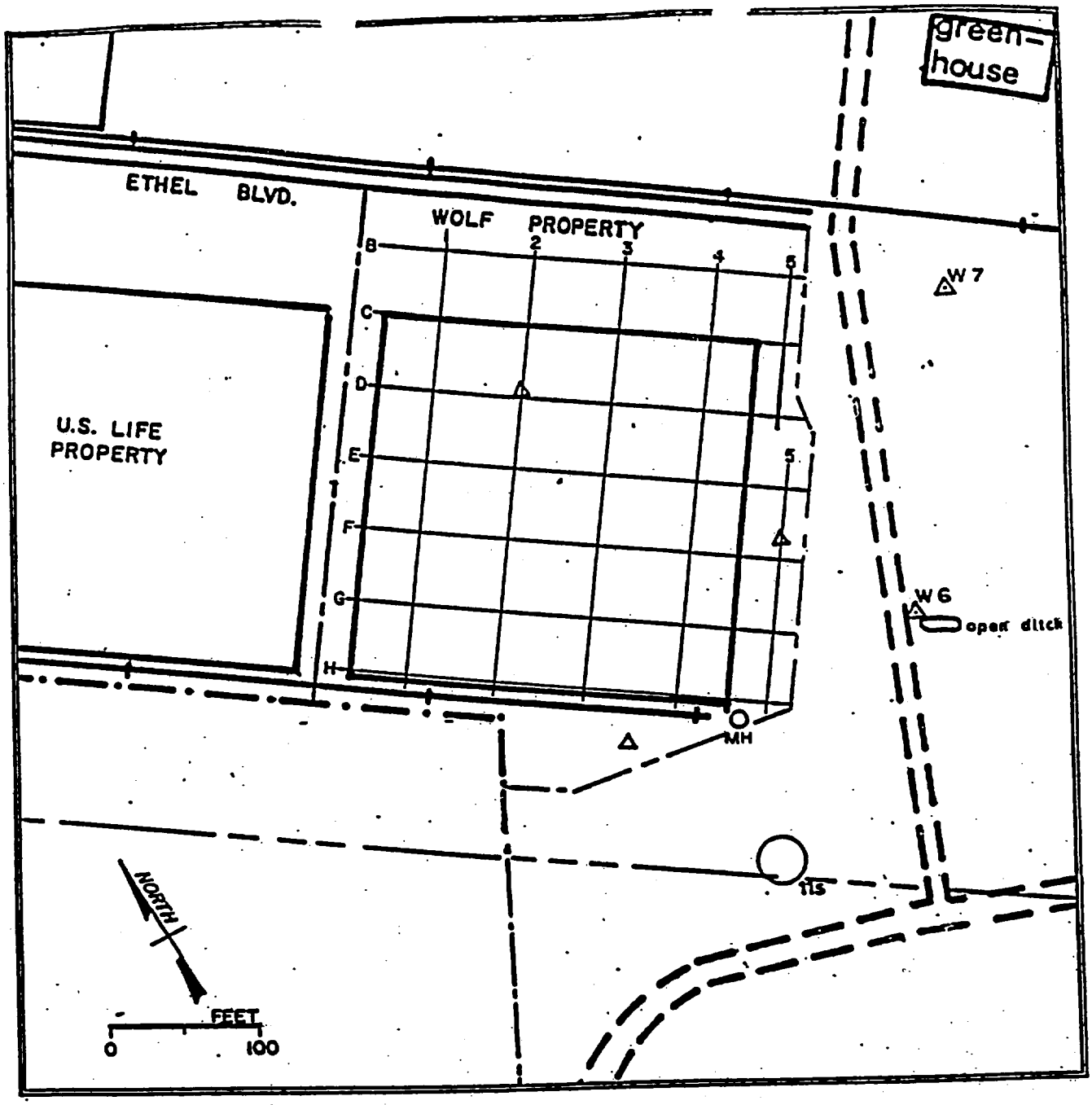
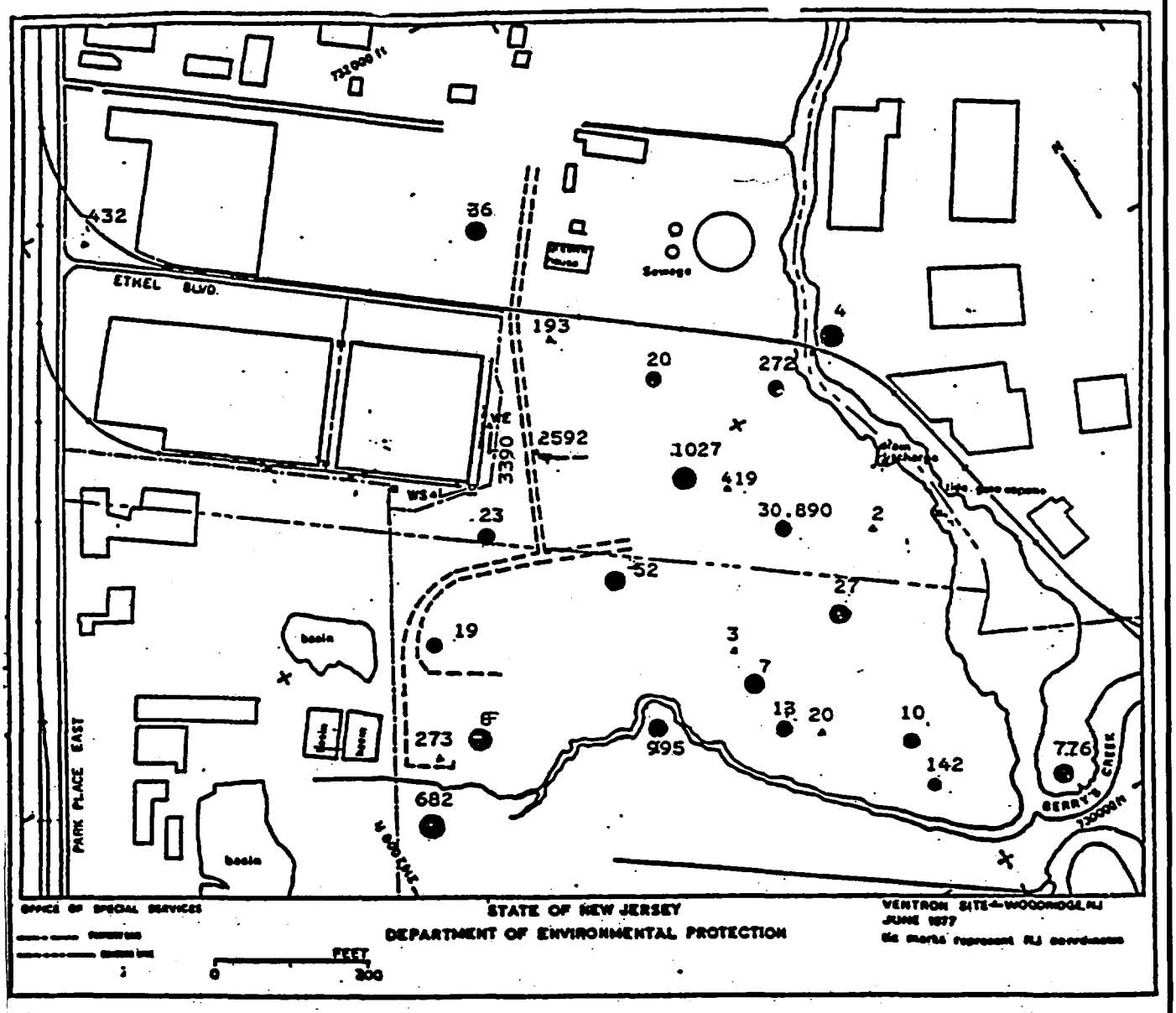


Figure 7. Grid pattern utilized to select sites from which samples of soil were collected by the New Jersey Testing Laboratories, Inc., during September 1974 (WV-18). The results of analyses for mercury are displayed in Table 16.

Figure B-5. JMA 1977.

831200087



● Soil Station

▲ Observation Well

■ Surface Water Station

Figure 6. Mean concentrations of mercury in the surficial 24 inches of soil.

Figure B-6. JMA 1977.

831200088

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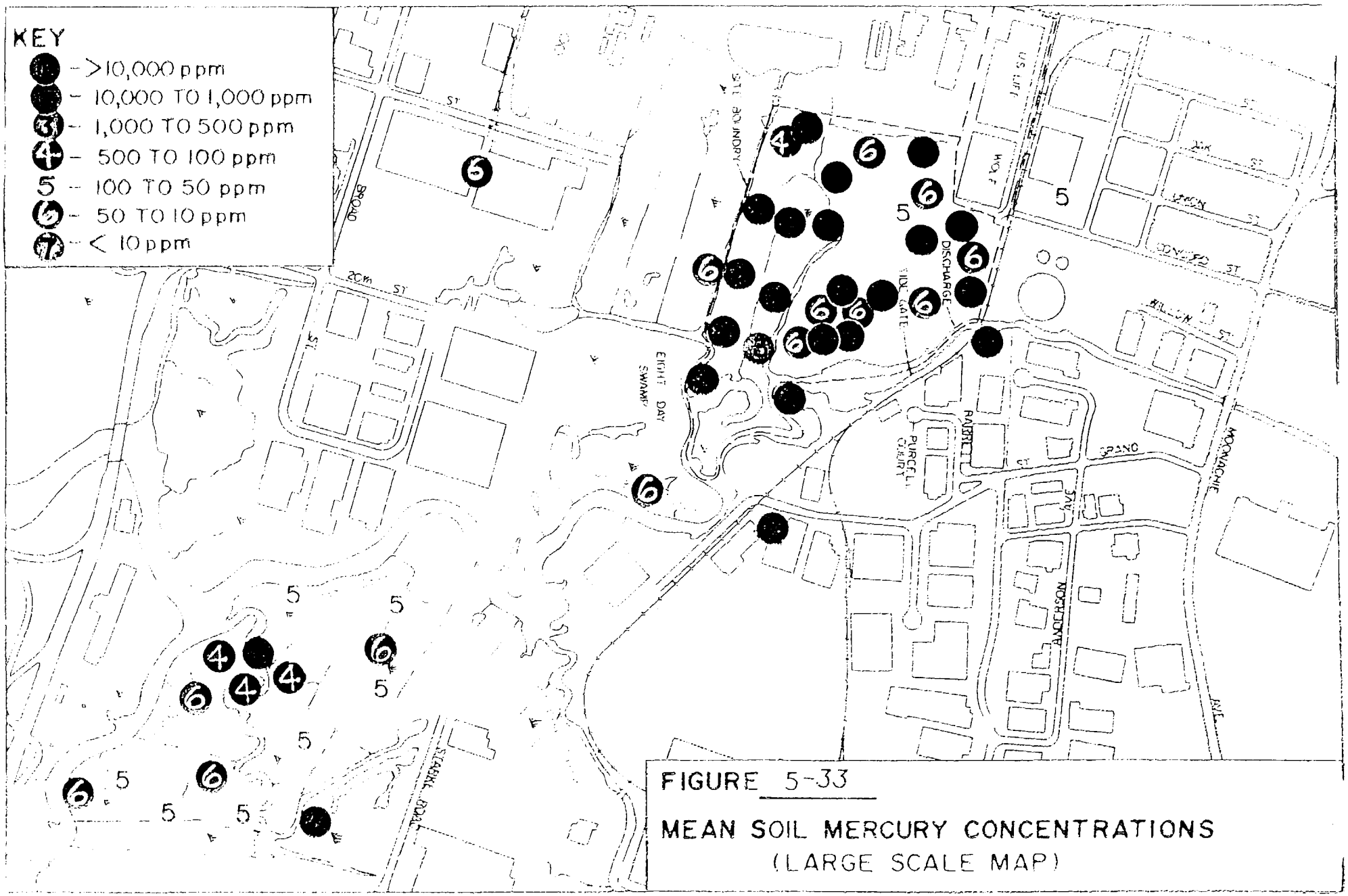


FIGURE 5-33

MEAN SOIL MERCURY CONCENTRATIONS
(LARGE SCALE MAP)

831200089

Figure B-7. (ERM 1985).

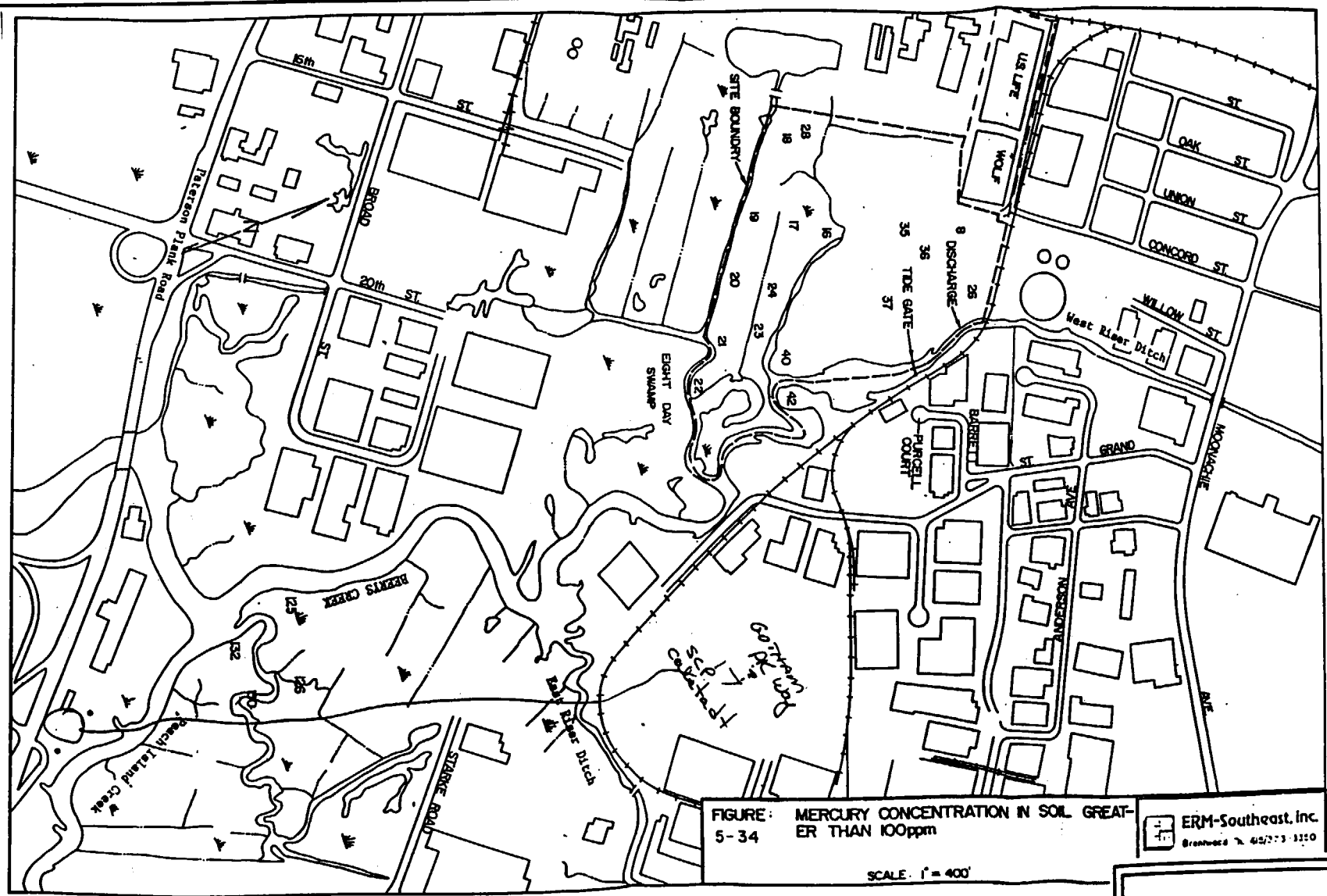
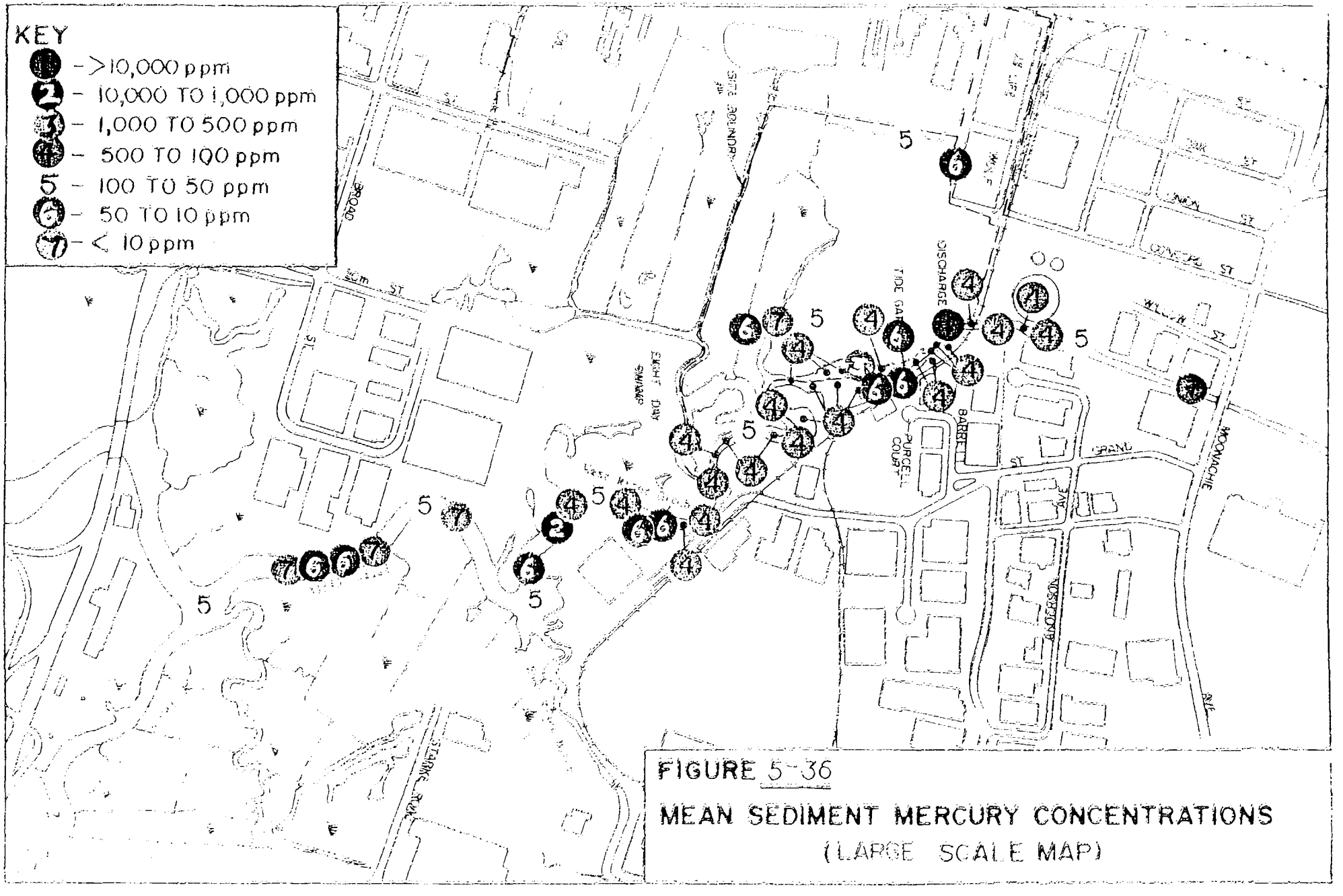


Figure B-8. ERM 1985.

831200090



831200091

Figure B-9. (ERM 1985).

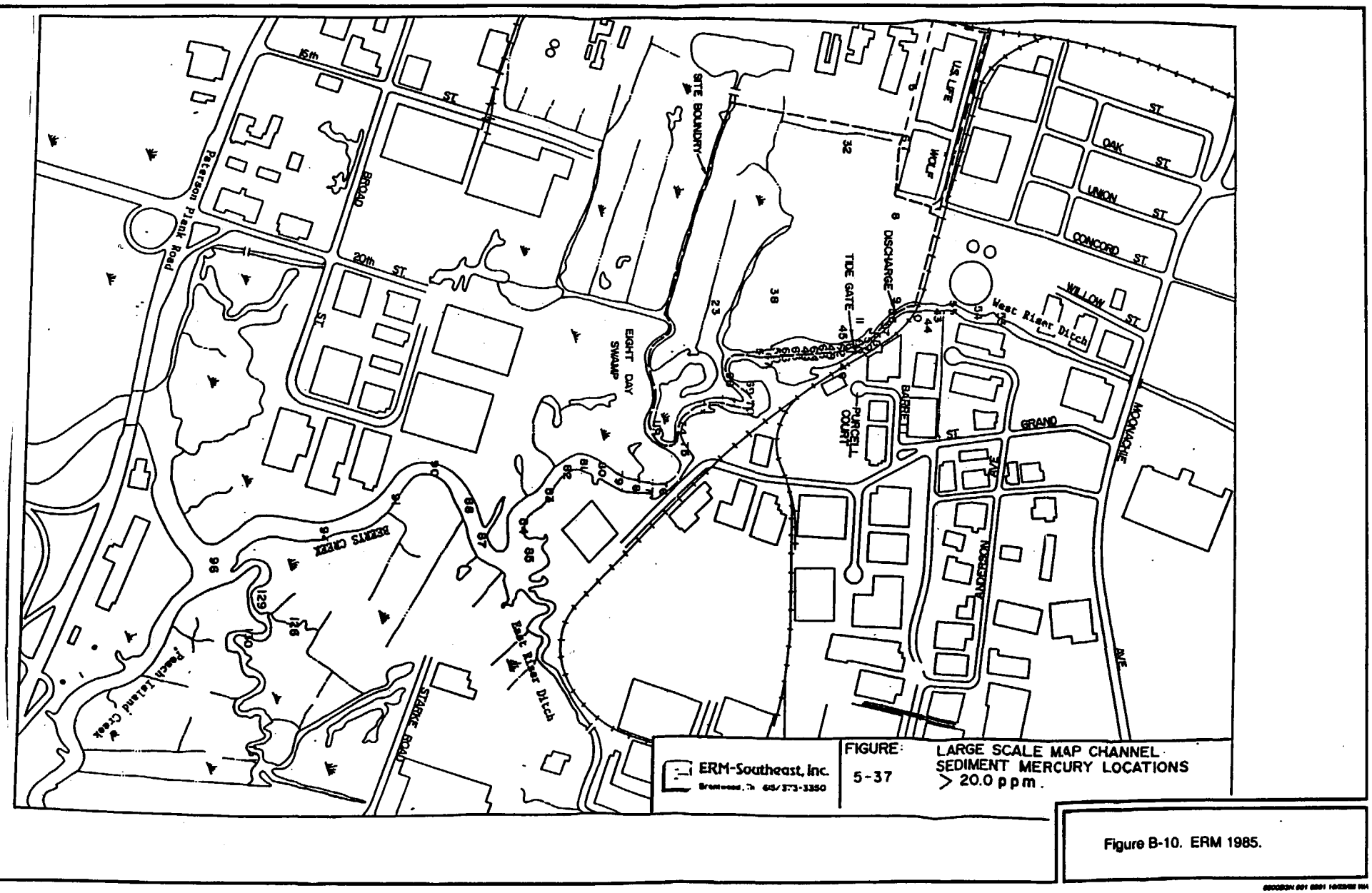


Figure B-10. ERM 1985.

831200092

Table 16. Concentrations (levels) of mercury in samples of soil collected during September 1974 from the property owned by Wolf Realty (continued).

Site	Depth	Level	Site	Depth	Level
G-1	0	3,800	H-3	0	90
	1	1,430		1	50
	2	2,850		2	1,520
G-2	0	1,000	H-4	0	70
	1	950		1	70
	2	3,230		2	30
G-3	0	37,260	H-5	0	7,560
	1	19,000		1	9,500
	2	1,630		2	10,830
G-4	0	3,040			
	1	11,020	MEAN		12,800
	2	1,440			
			MAXIMUM		142,500
G-5	0	1,620			
	1	72,920			
	2	24,130			
H-1	0	1,800			
	1	1,520			
	2	2,850			
H-2	0	2,470			
	1	14,250			
	2	1,520			

[a]Codes for depths are: 0, surface or 6 or 8 inches to 12 inches in depth. 2, from 1 to 2 feet in depth; 2, from 2 to 3 feet in depth; A, 0.75 to 1.75 feet; B, 1.75 to 2.75 feet; C, 2.75 to 3.0 feet; D, 0.5 to 1.5 feet; E, 1.5 to 2.5 feet; F, 2.5 to 3.0 feet; G, collected by a backhoe, depth not specified

Table B-1. JMA 1977.